

Reproducible moldable interactions

Master Thesis

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Motivation

DEMO

Motivation

Sessions are lost on closing

Sessions cannot be replayed

Code has to be manually
extracted from a session

Demoing session requires
external tool support

Motivation

Persisting inspection sessions

Replaying entire sessions

Generating code

Creating movie-like tutorials

Approach 1: UI recording

Inspector on a WorldMorph(562956288) [world]

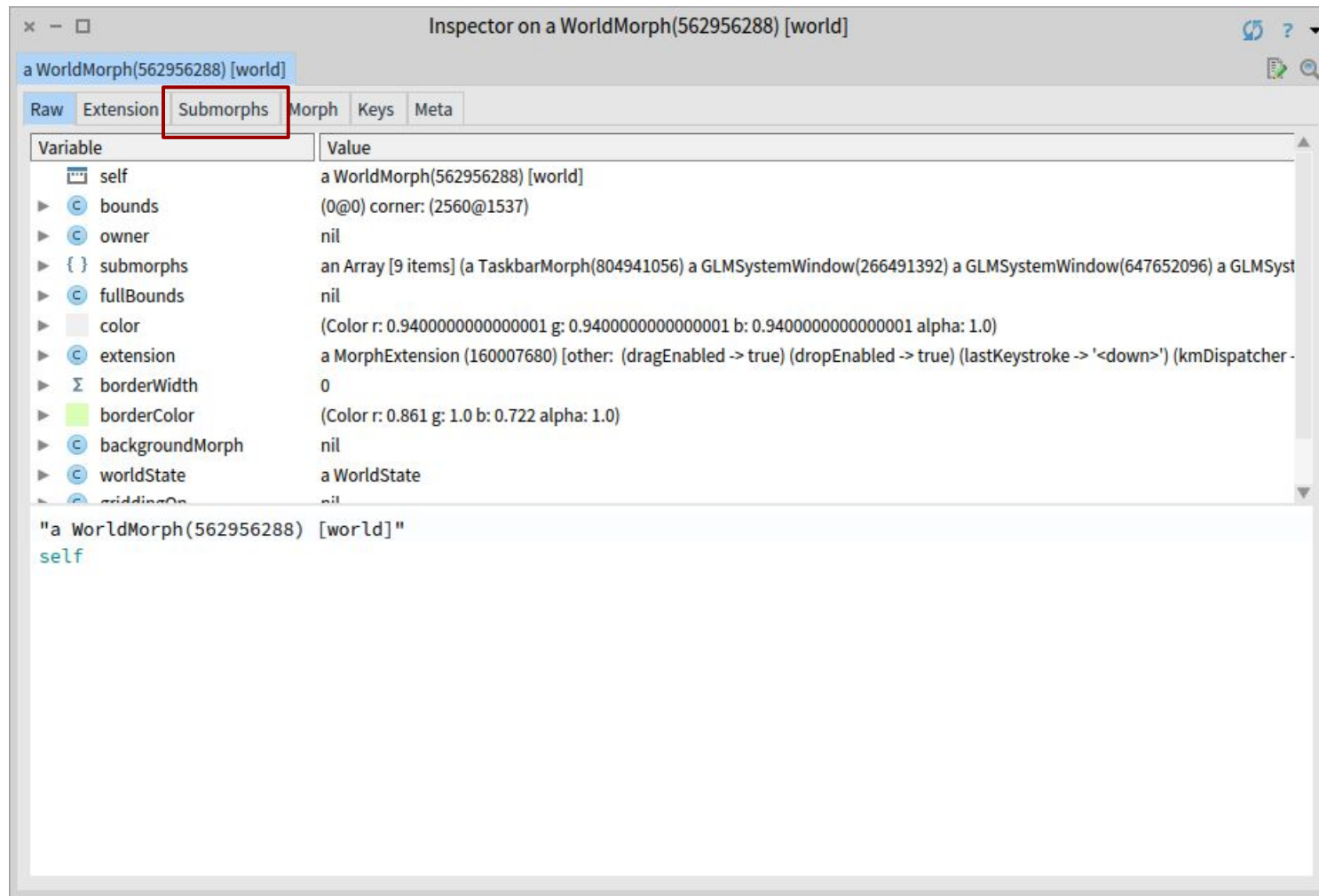
a WorldMorph(562956288) [world]

Raw Extension Submorphs Morph Keys Meta

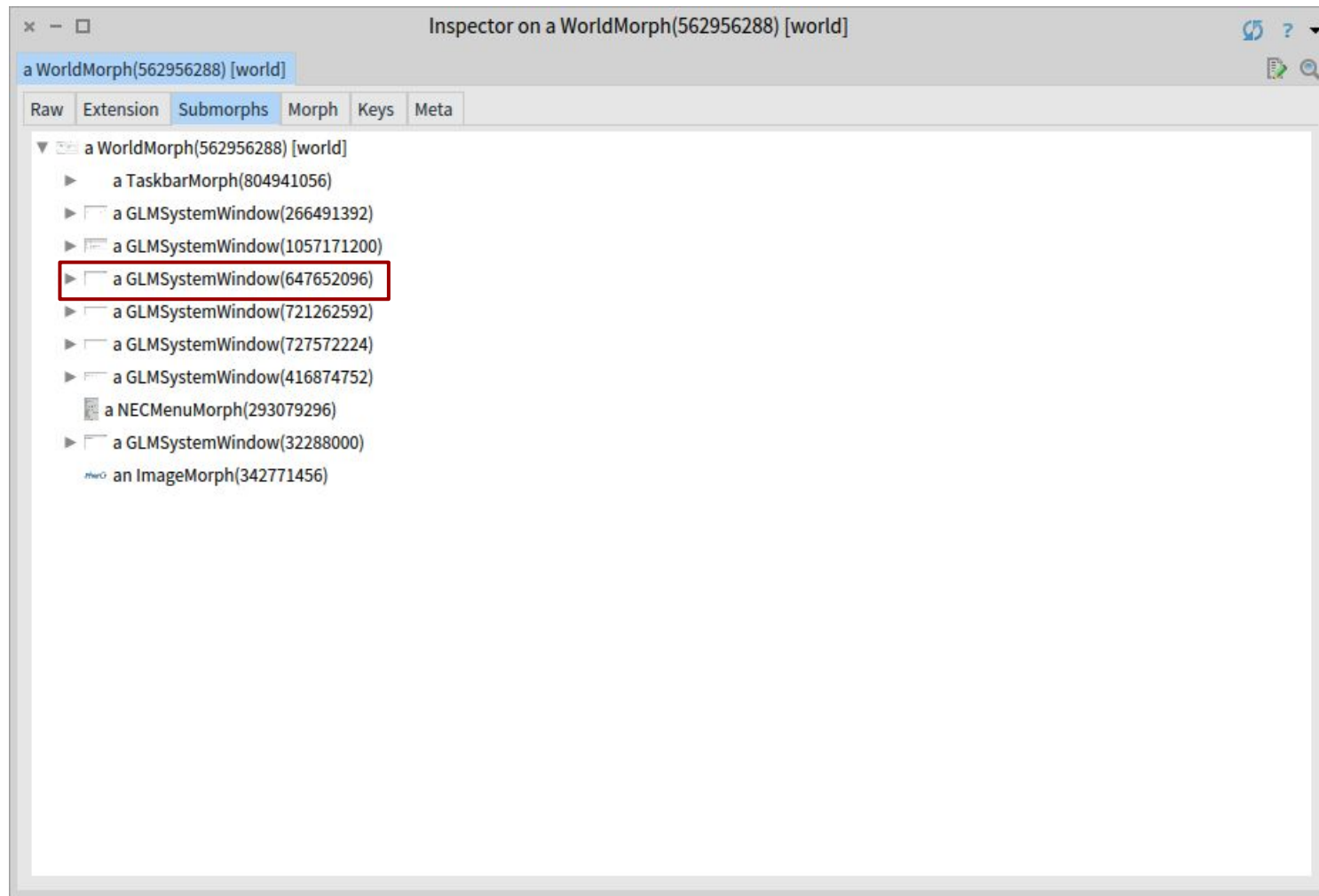
Variable	Value
self	a WorldMorph(562956288) [world]
bounds	(0@0) corner: (2560@1537)
owner	nil
submorphs	an Array [9 items] (a TaskbarMorph(804941056) a GLMSystemWindow(266491392) a GLMSystemWindow(647652096) a GLMSyst
fullBounds	nil
color	(Color r: 0.9400000000000001 g: 0.9400000000000001 b: 0.9400000000000001 alpha: 1.0)
extension	a MorphExtension (160007680) [other: (dragEnabled -> true) (dropEnabled -> true) (lastKeystroke -> '<down>') (kmDispatcher -
borderWidth	0
borderColor	(Color r: 0.861 g: 1.0 b: 0.722 alpha: 1.0)
backgroundMorph	nil
worldState	a WorldState
resizingOn	nil

"a WorldMorph(562956288) [world]"

self

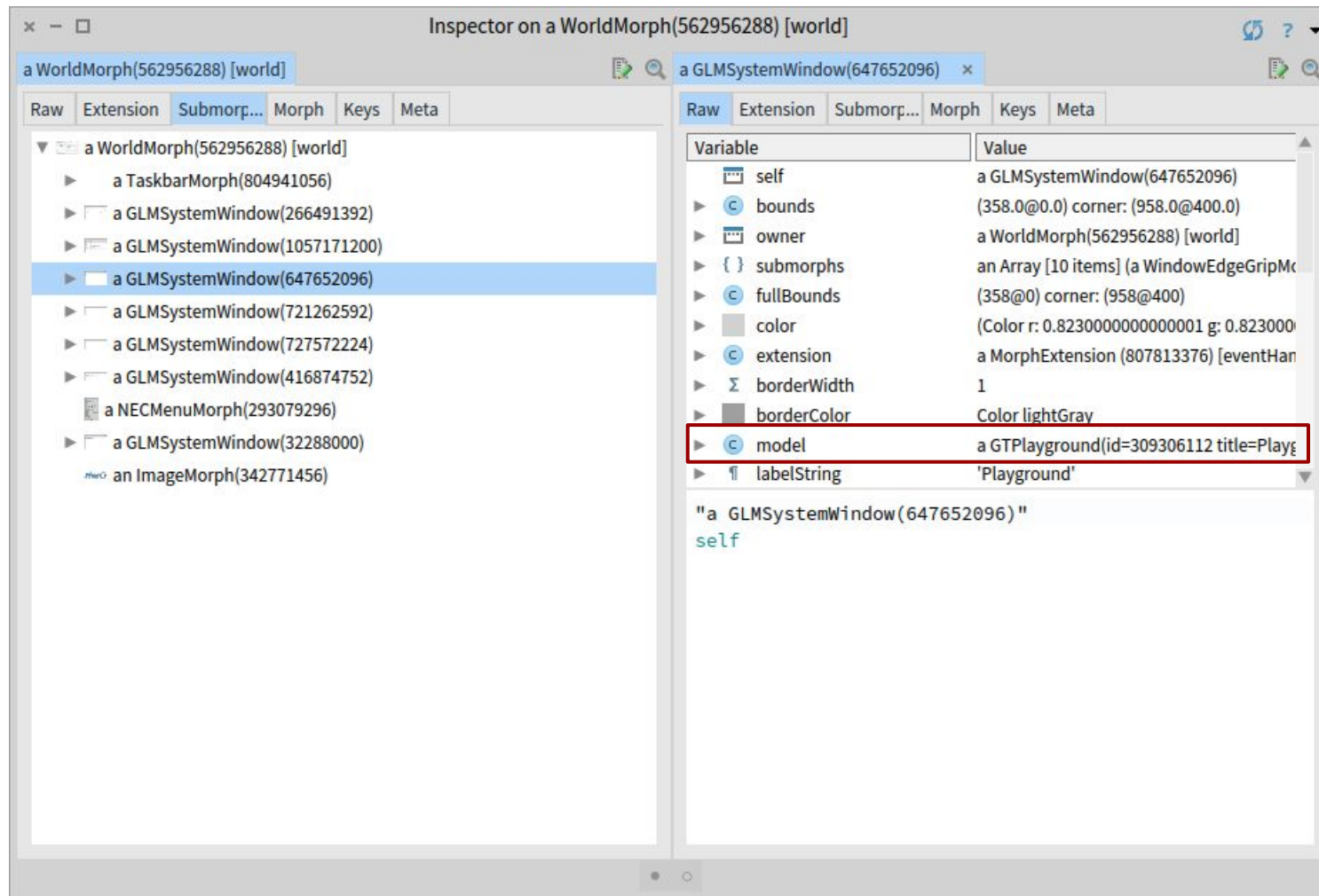


Record click: 200@100



Record click: 200@100

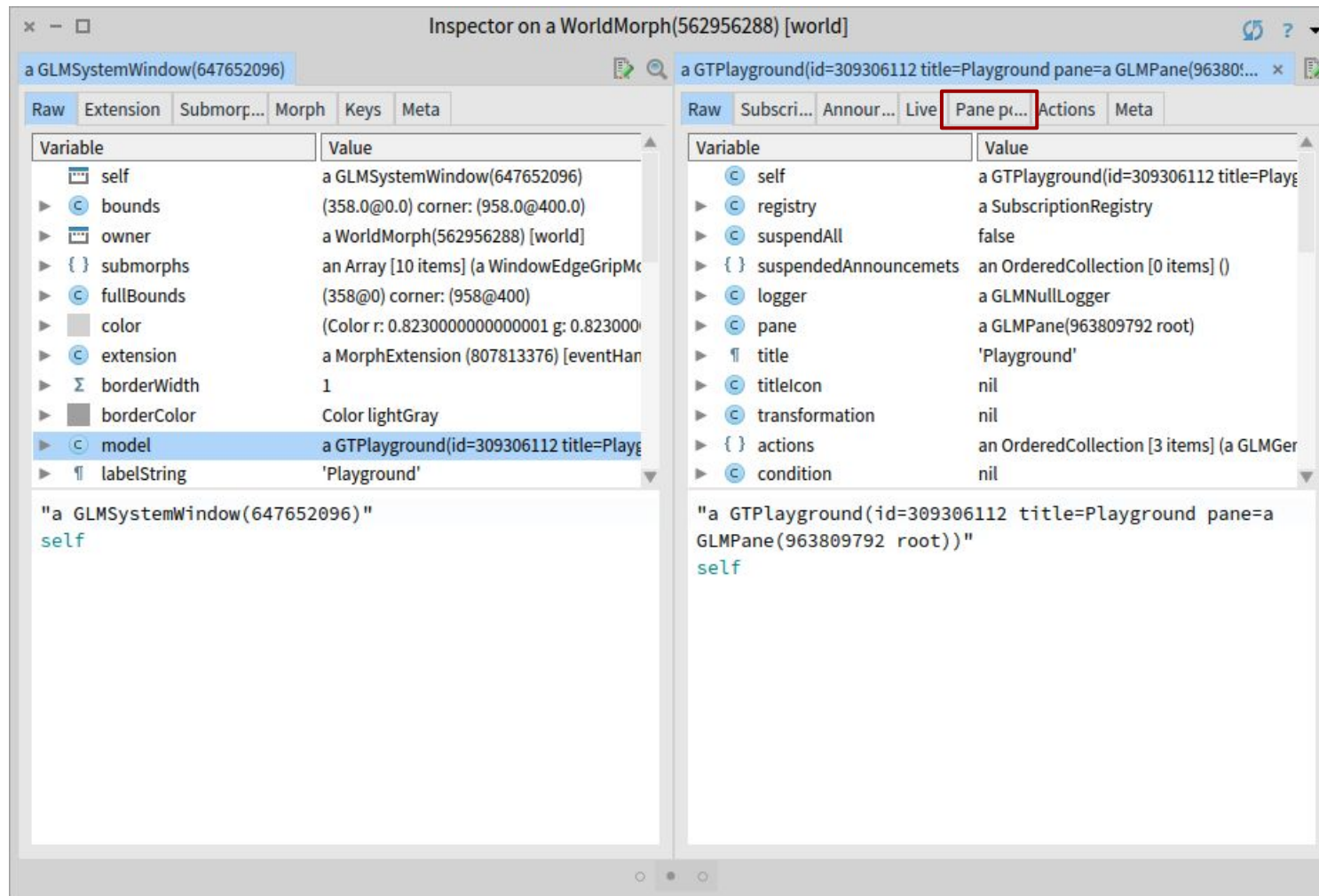
Record click: 150@300



Record click: 200@100

Record click: 150@300

Record click: 400@400

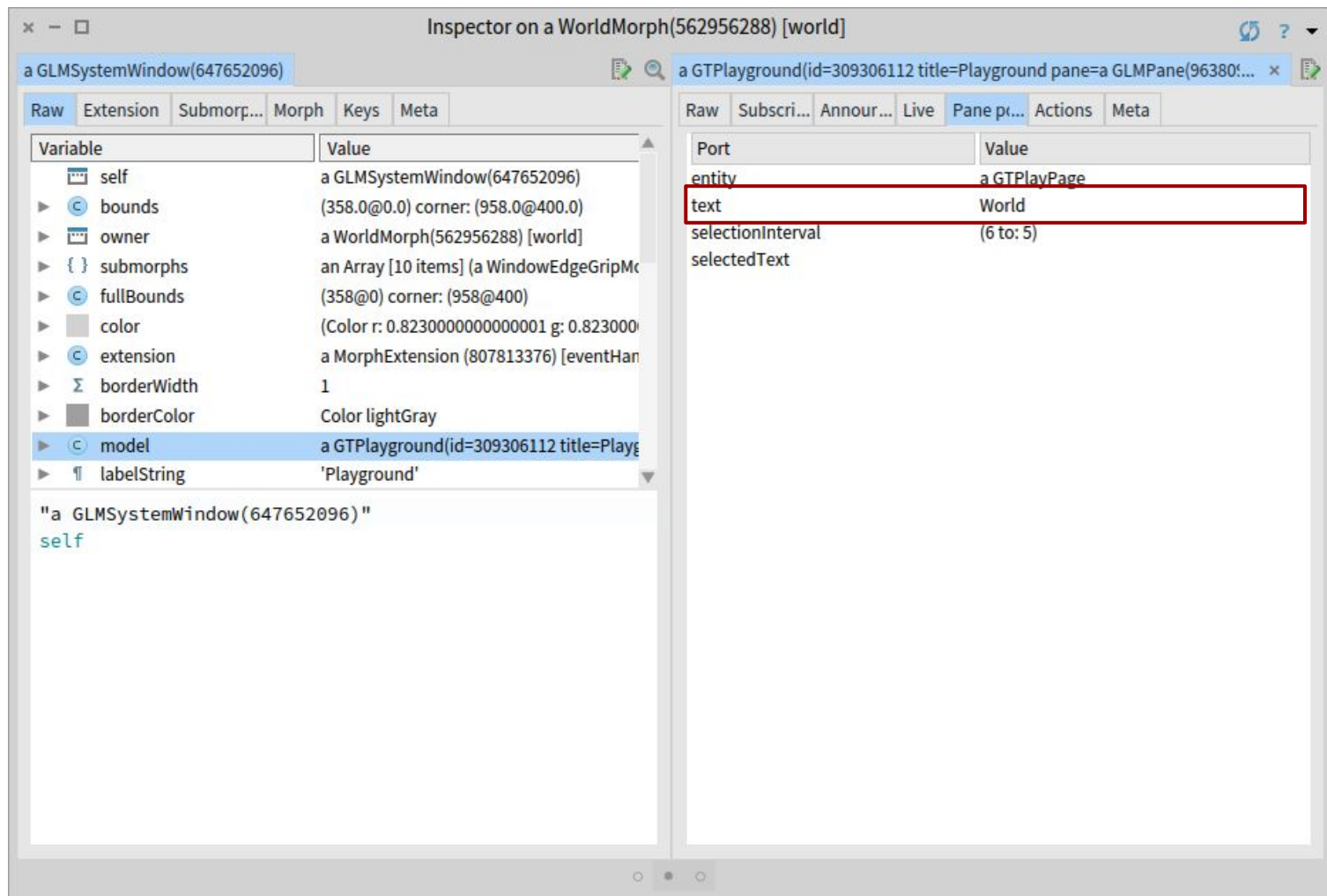


Record click: 200@100

Record click: 150@300

Record click: 400@400

Record click: 450@100



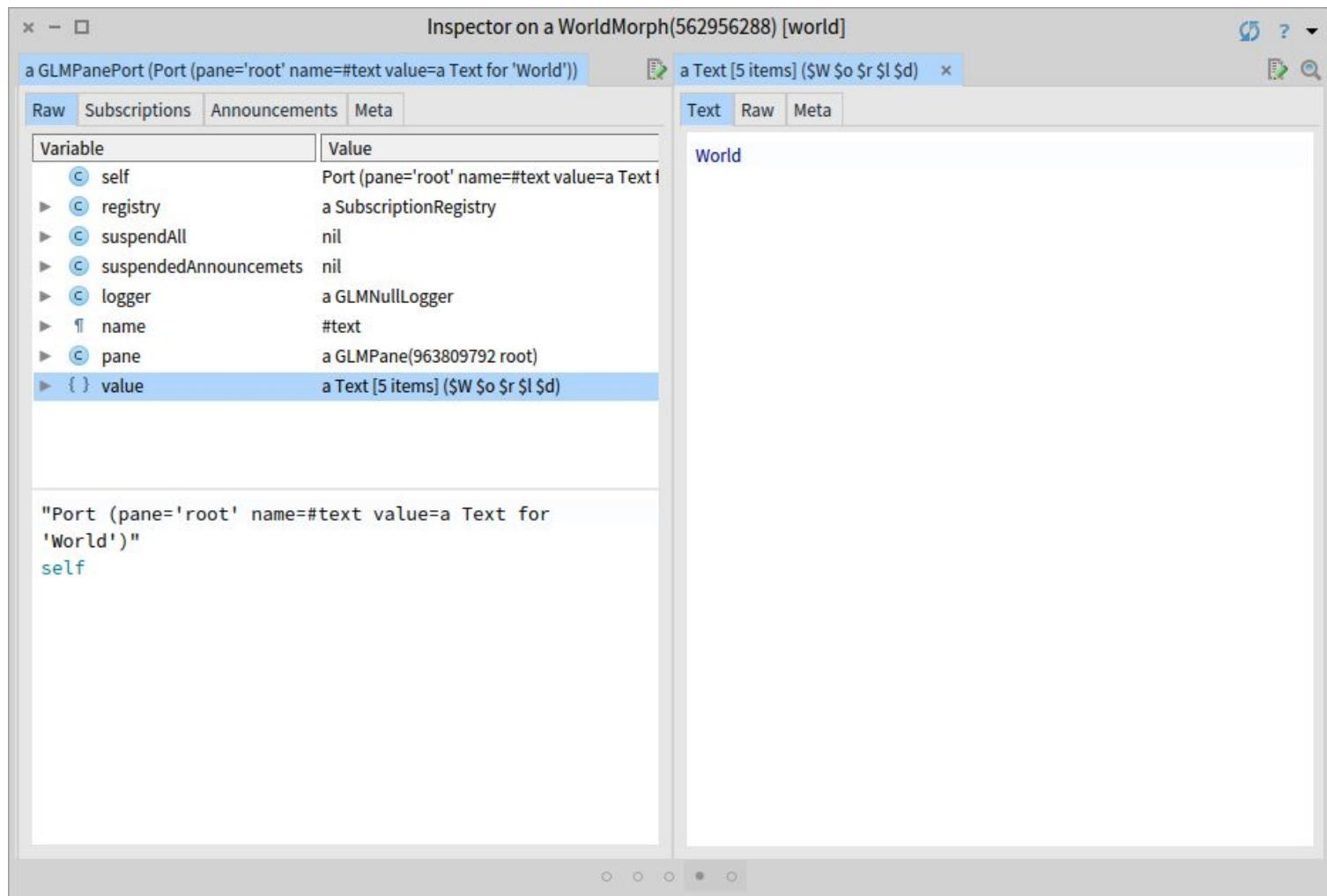
Record click: 200@100

Record click: 150@300

Record click: 400@400

Record click: 450@100

Record click: 500@200



Record click: 200@100

Record click: 150@300

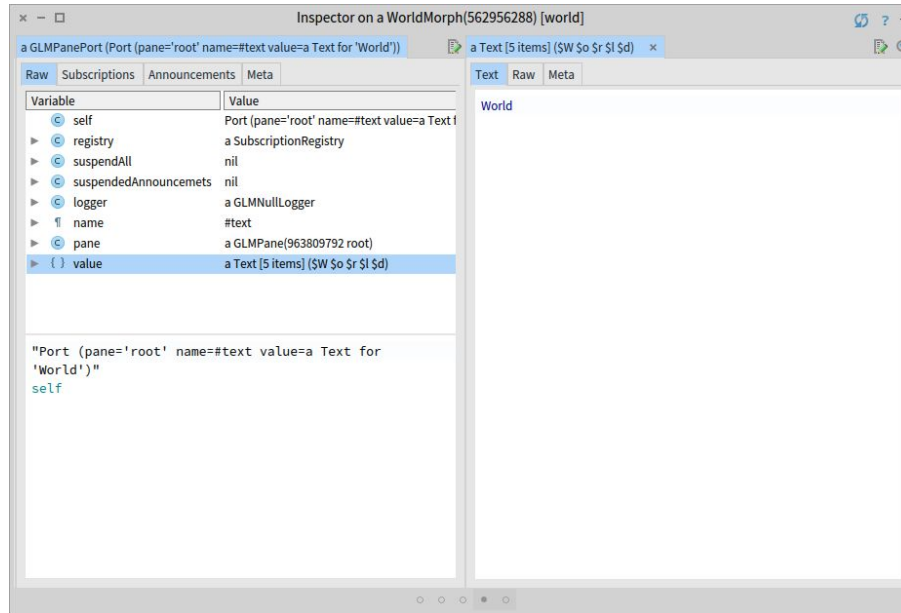
Record click: 400@400

Record click: 450@100

Record click: 500@200



Persist clicks



Record click: 200@100

Record click: 150@300

Record click: 400@400

Record click: 450@100

Record click: 500@200

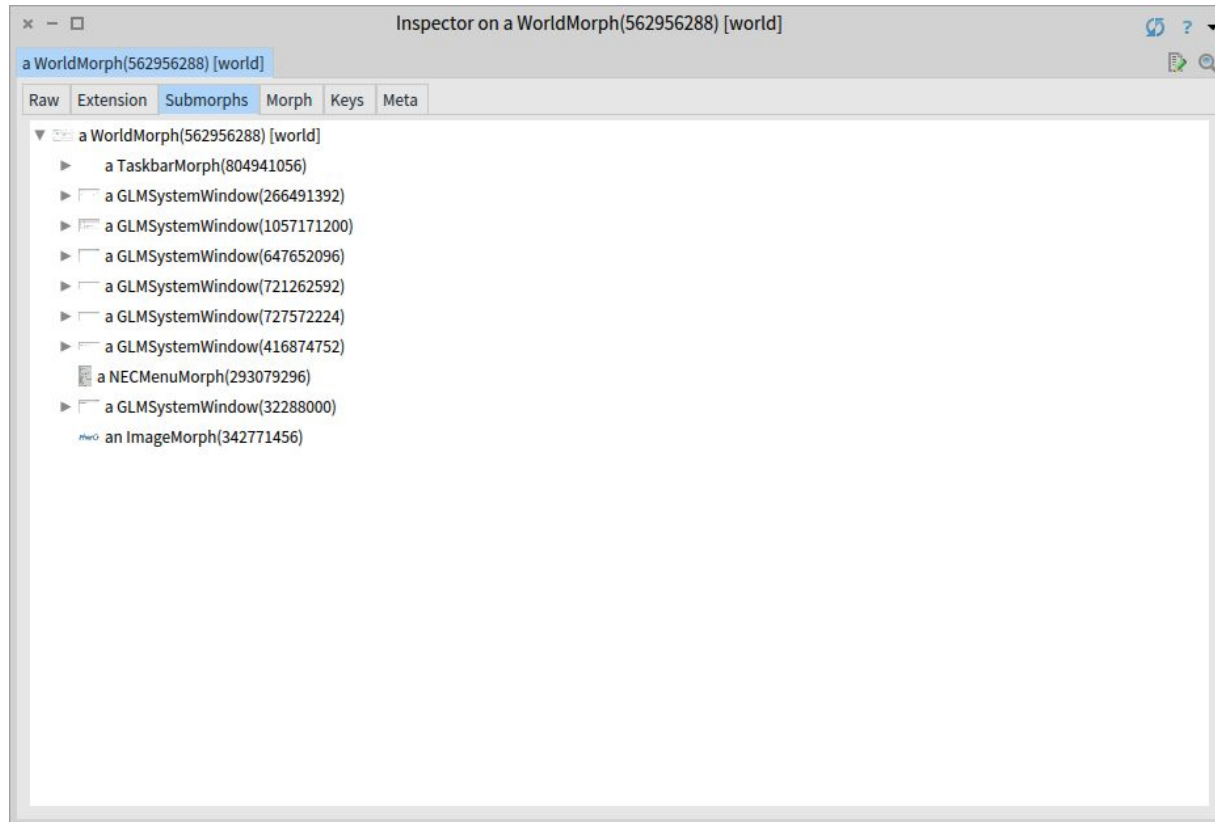


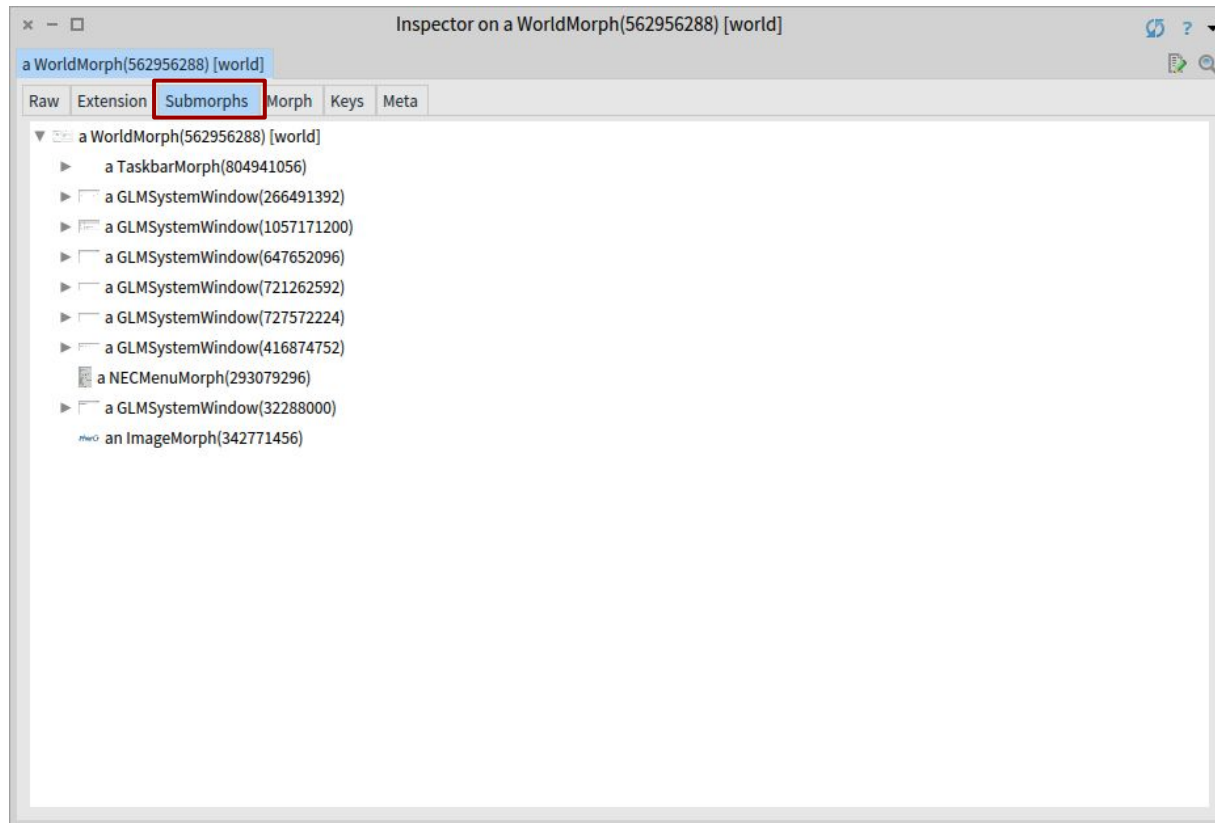
Persist clicks

easy to record
easy to replay

hardcodes position
not implementable in a generic way

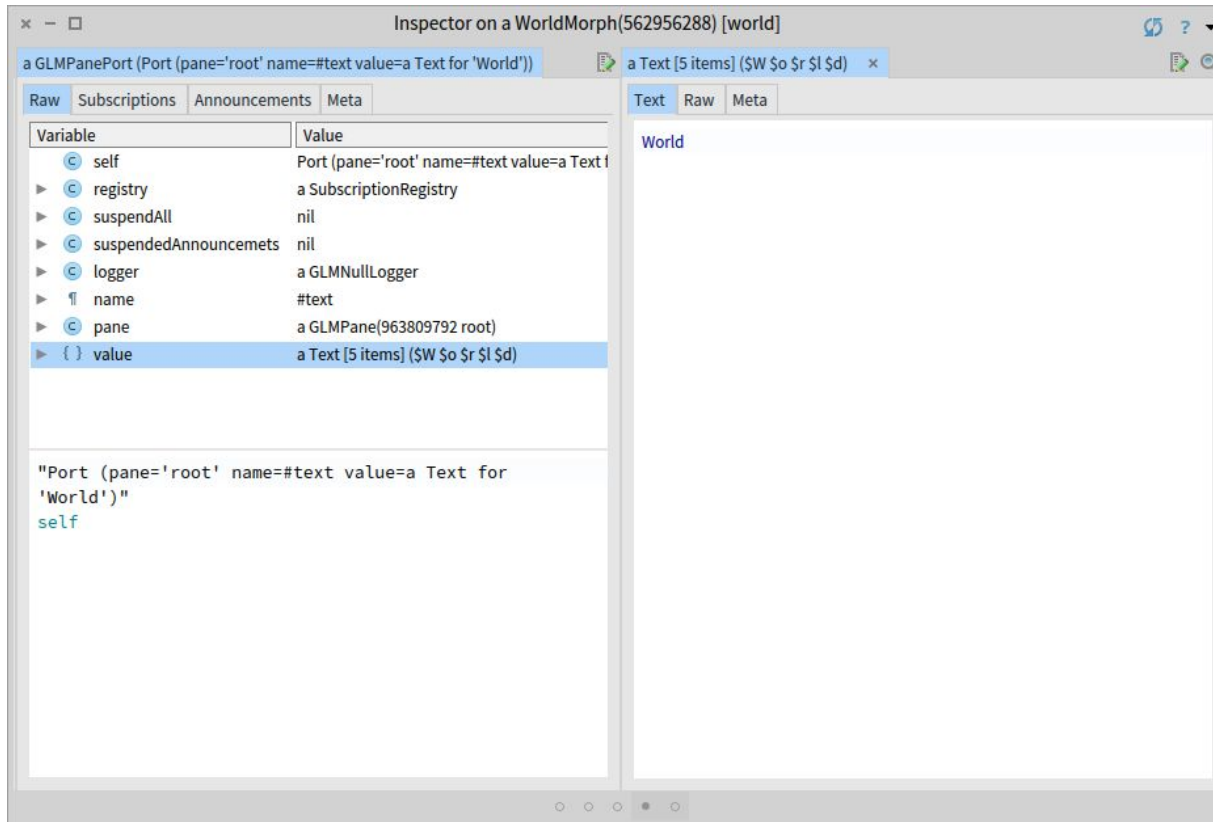
Approach 2: Serialization





FLSerializer serializeToArray:anInspector.

inspector-`{timestamp}`.fuel



FLSerializer serializeToArray:anInspector.

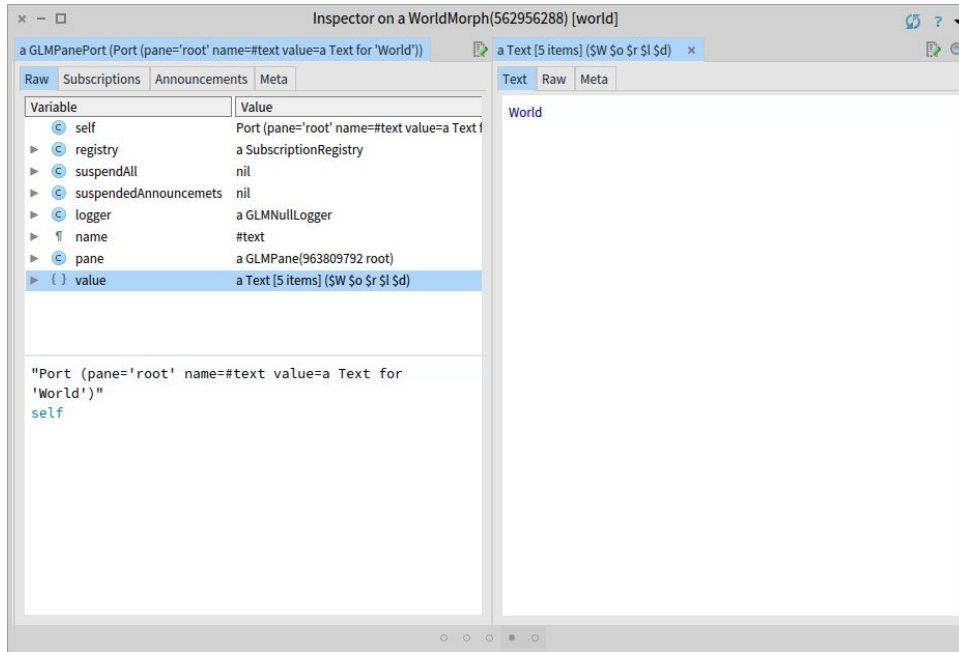
inspector-{{timestamp}}.fuel

inspector-{{timestamp}}.fuel

inspector-{{timestamp}}.fuel

inspector-{{timestamp}}.fuel

inspector-{{timestamp}}.fuel



FLSerializer serializeToByteArray:anInspector.

inspector-{timestamp}.fuel

inspector-{timestamp}.fuel

inspector-{timestamp}.fuel

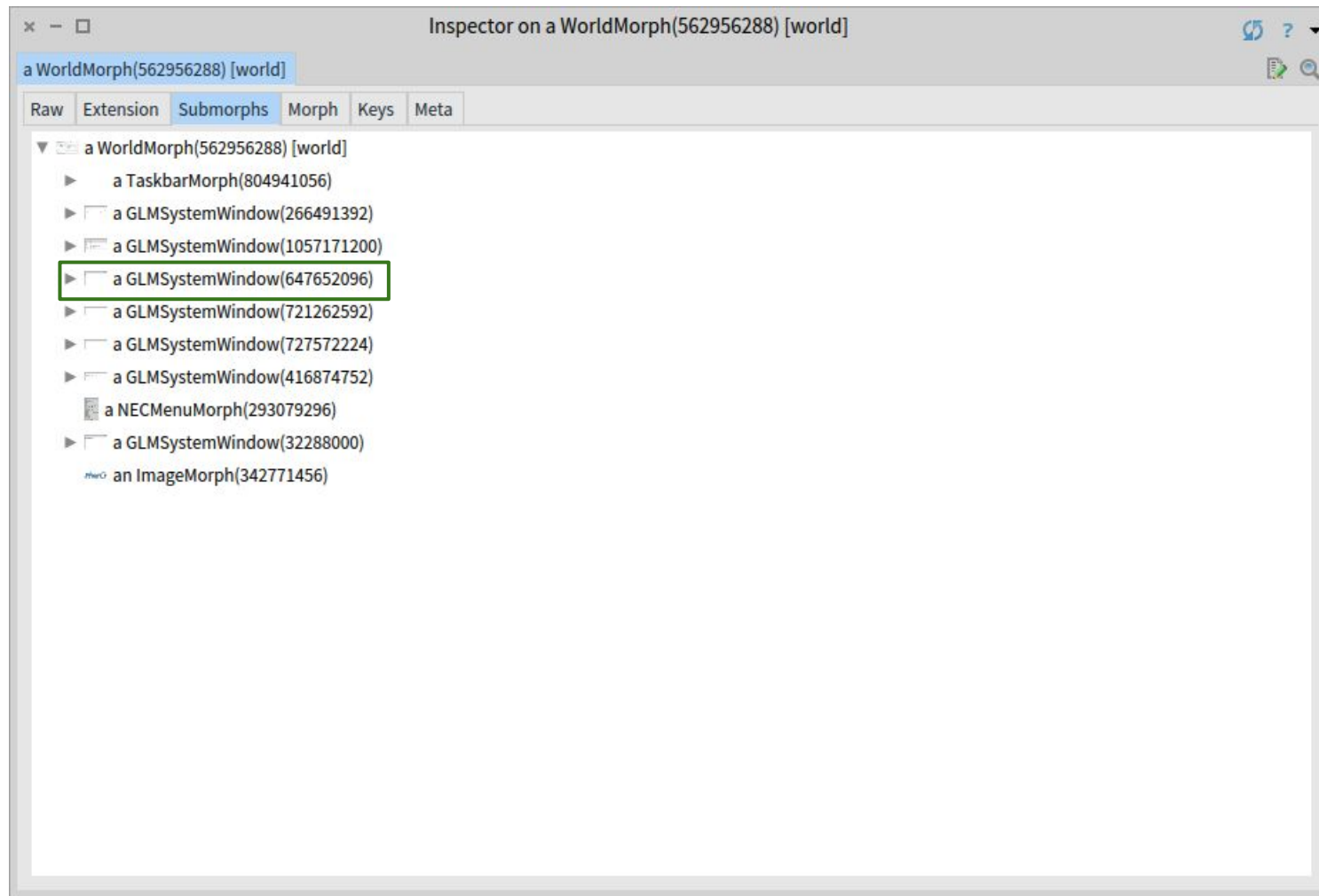
inspector-{timestamp}.fuel

inspector-{timestamp}.fuel

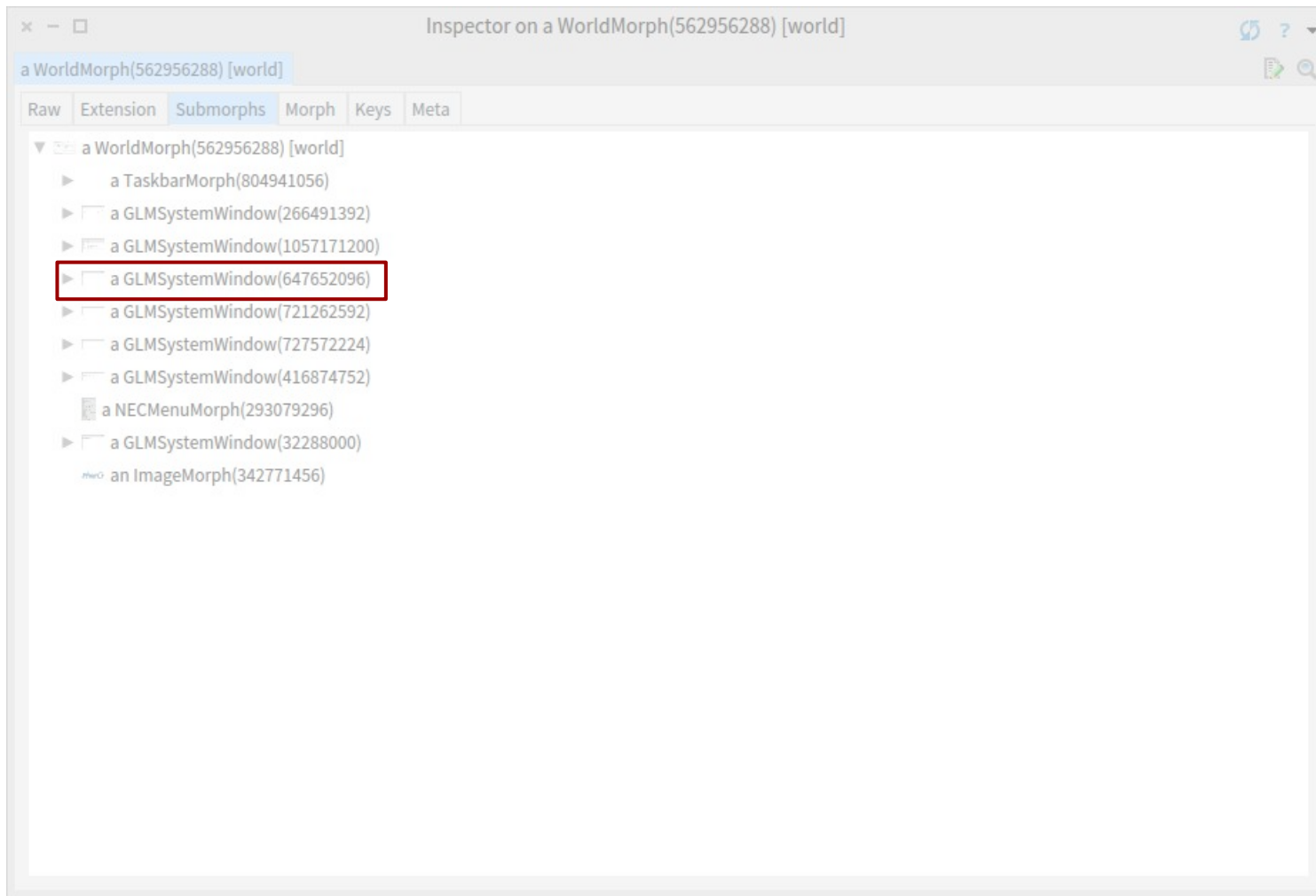
independent of UI
easy to implement

duplicated information
inflexible and brittle

A moldable approach

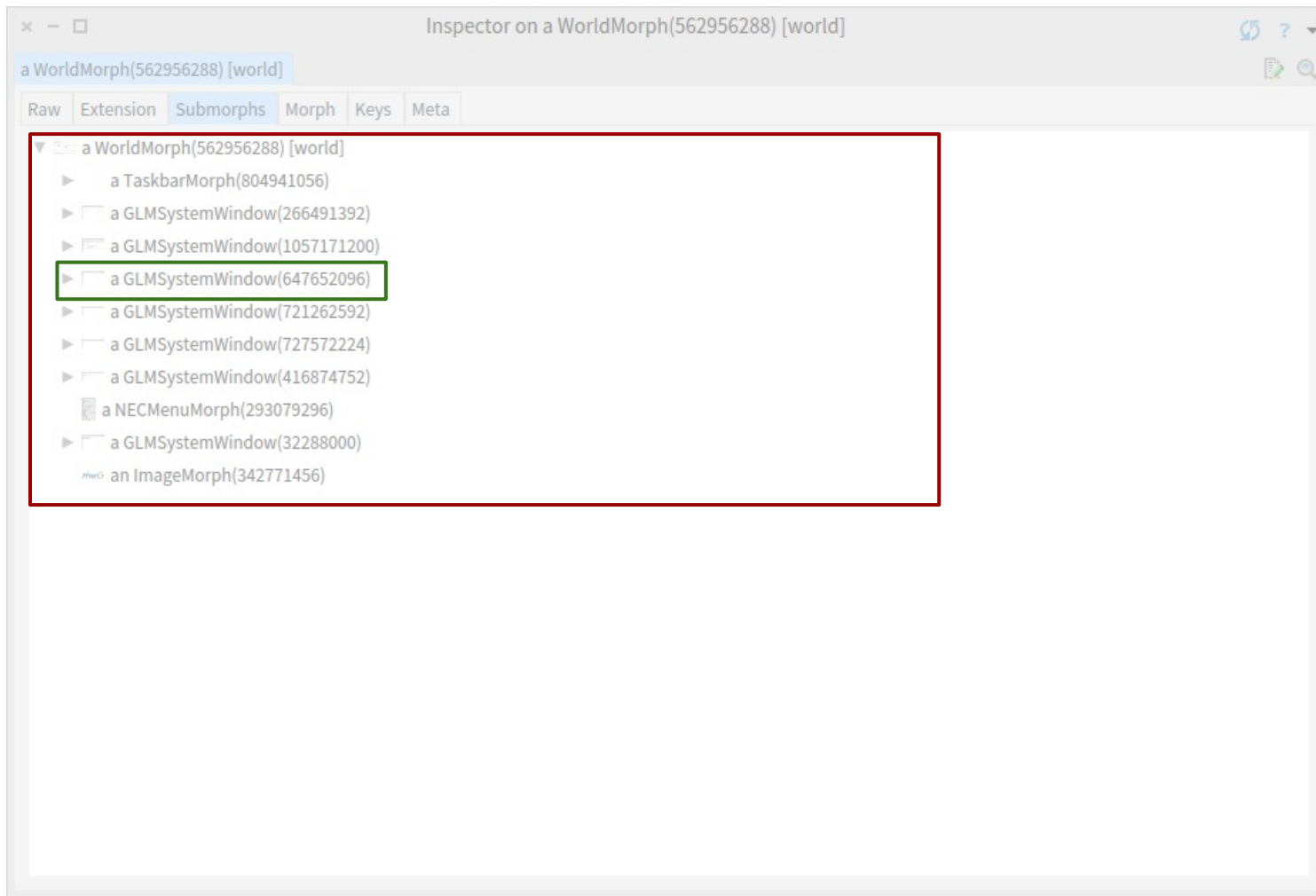


Record click: 150@300



Click events

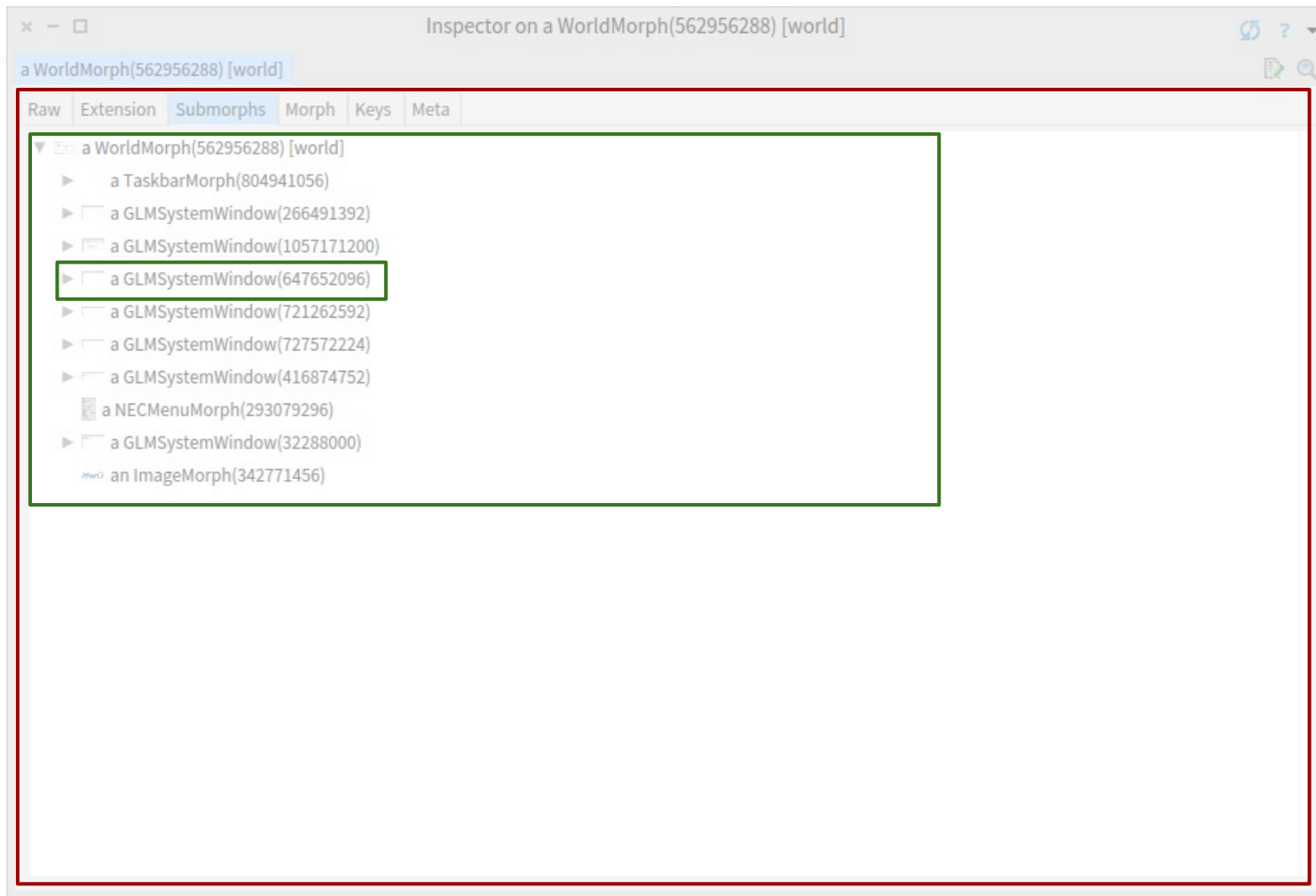
childAt: 4



Click events

childAt: 4

childAt: 1

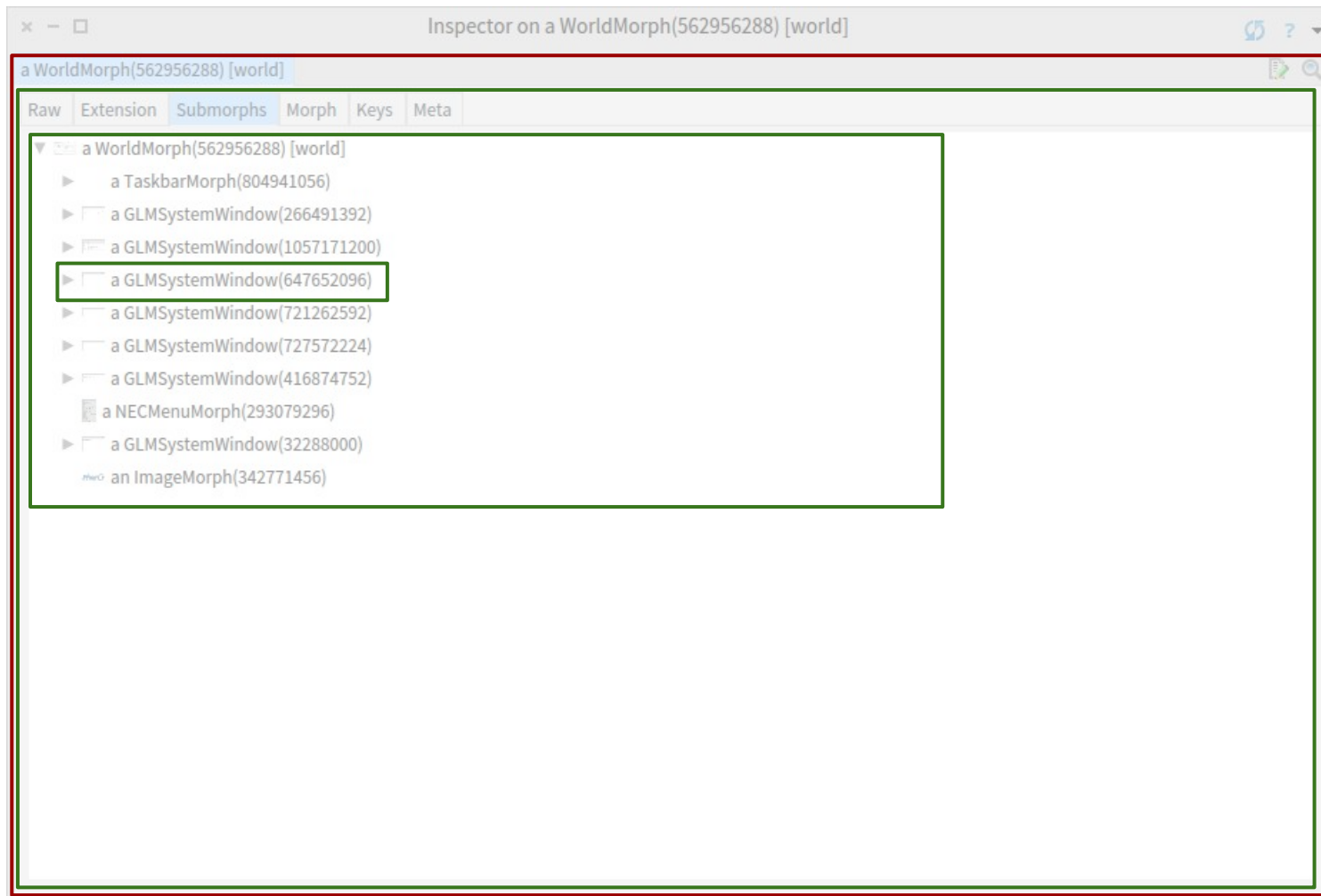


Click events

childAt: 4

childAt: 1

childAt: 3



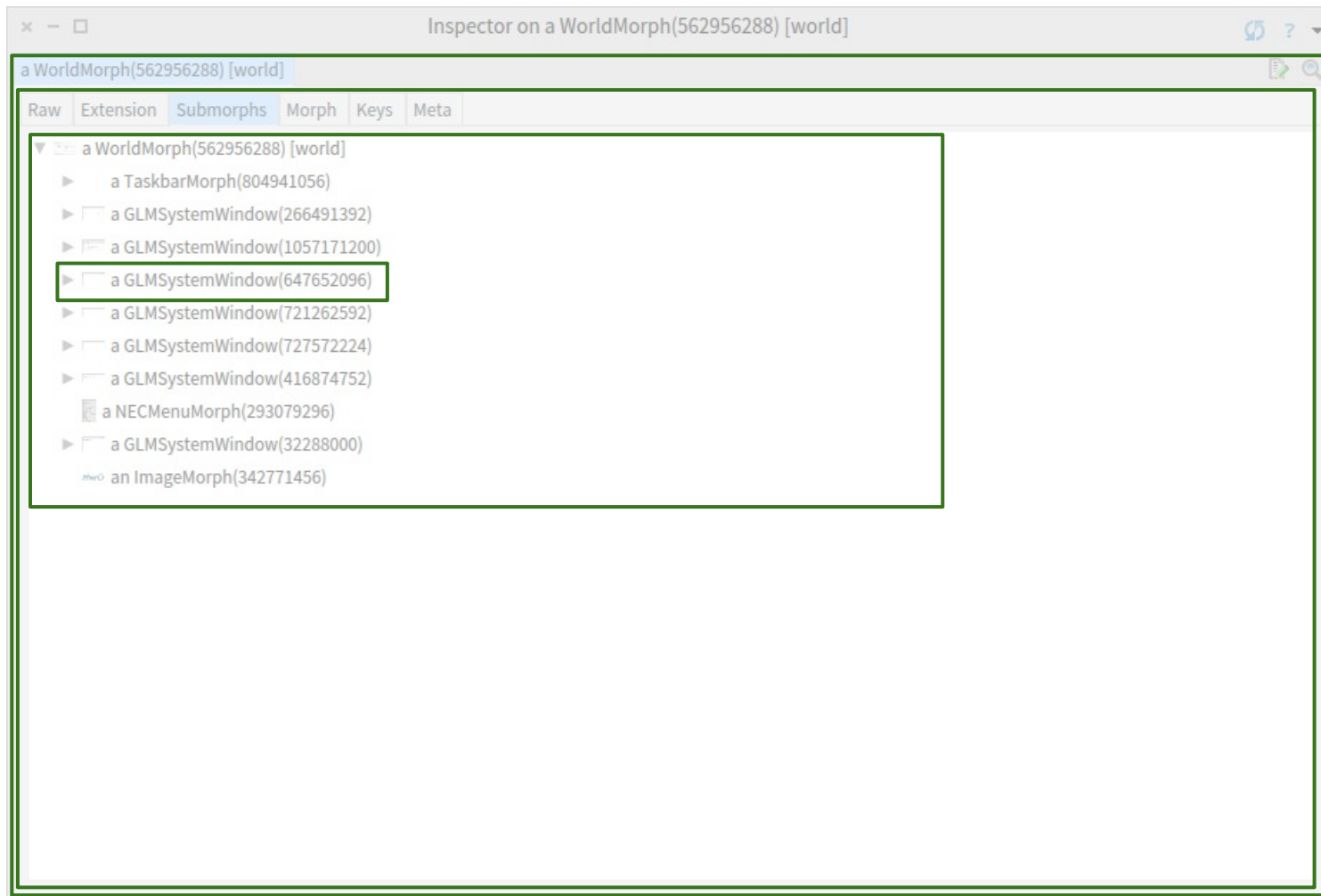
Click events

childAt: 4

childAt: 1

childAt: 3

childAt: 1



Click events

childAt: 4

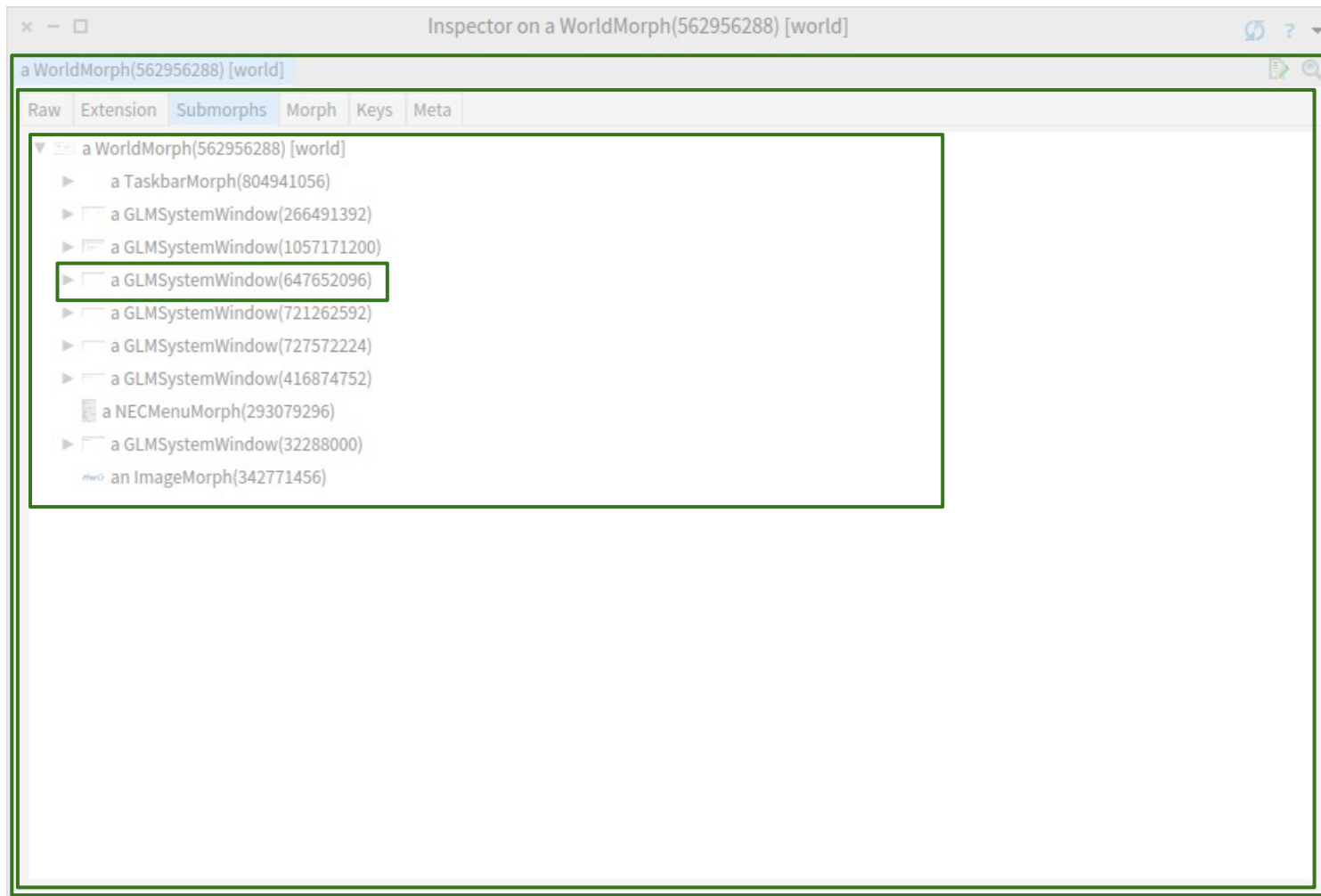
childAt: 1

childAt: 3

childAt: 1



Persist UI
element path



Click events

childAt: 4

childAt: 1

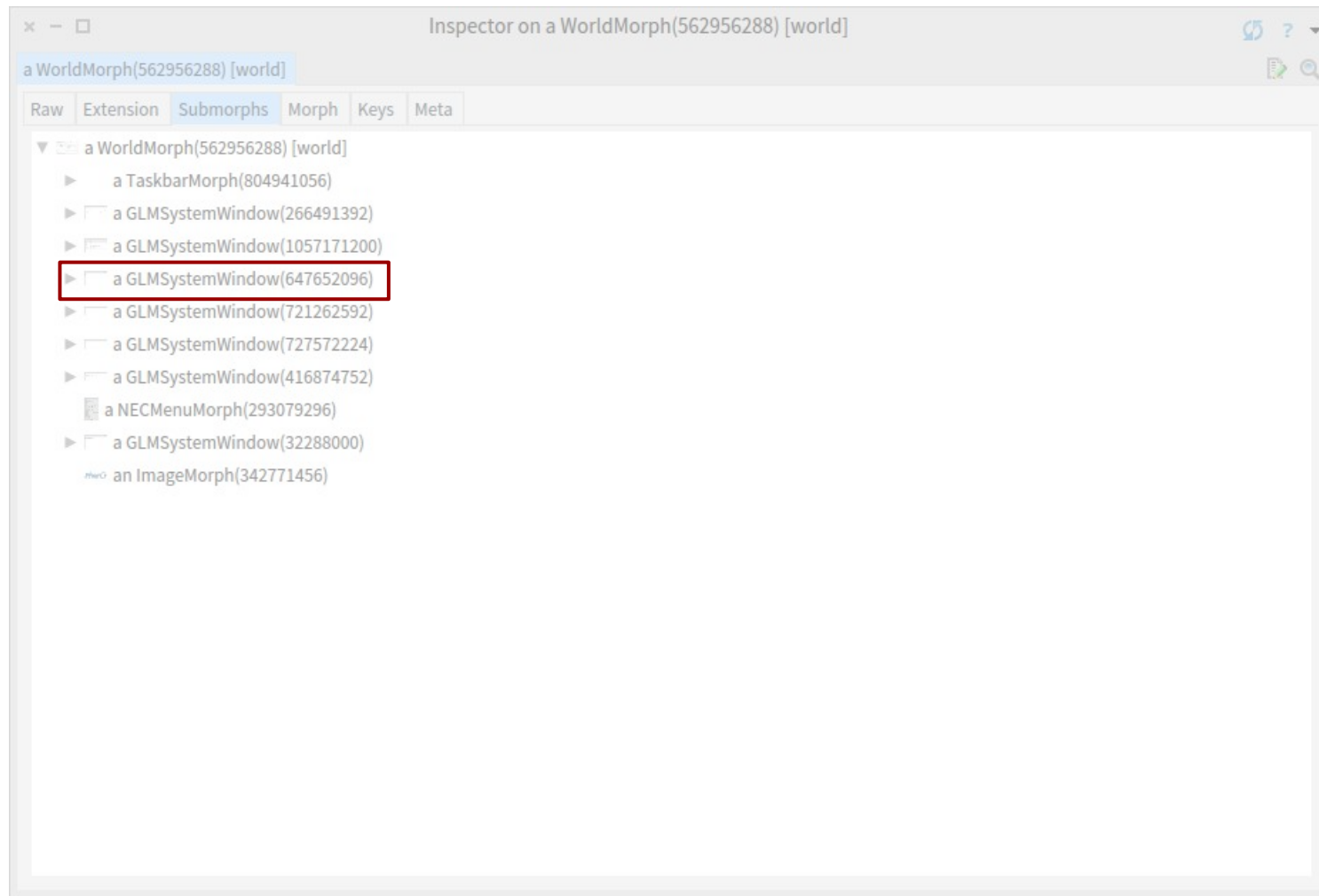
childAt: 3

childAt: 1



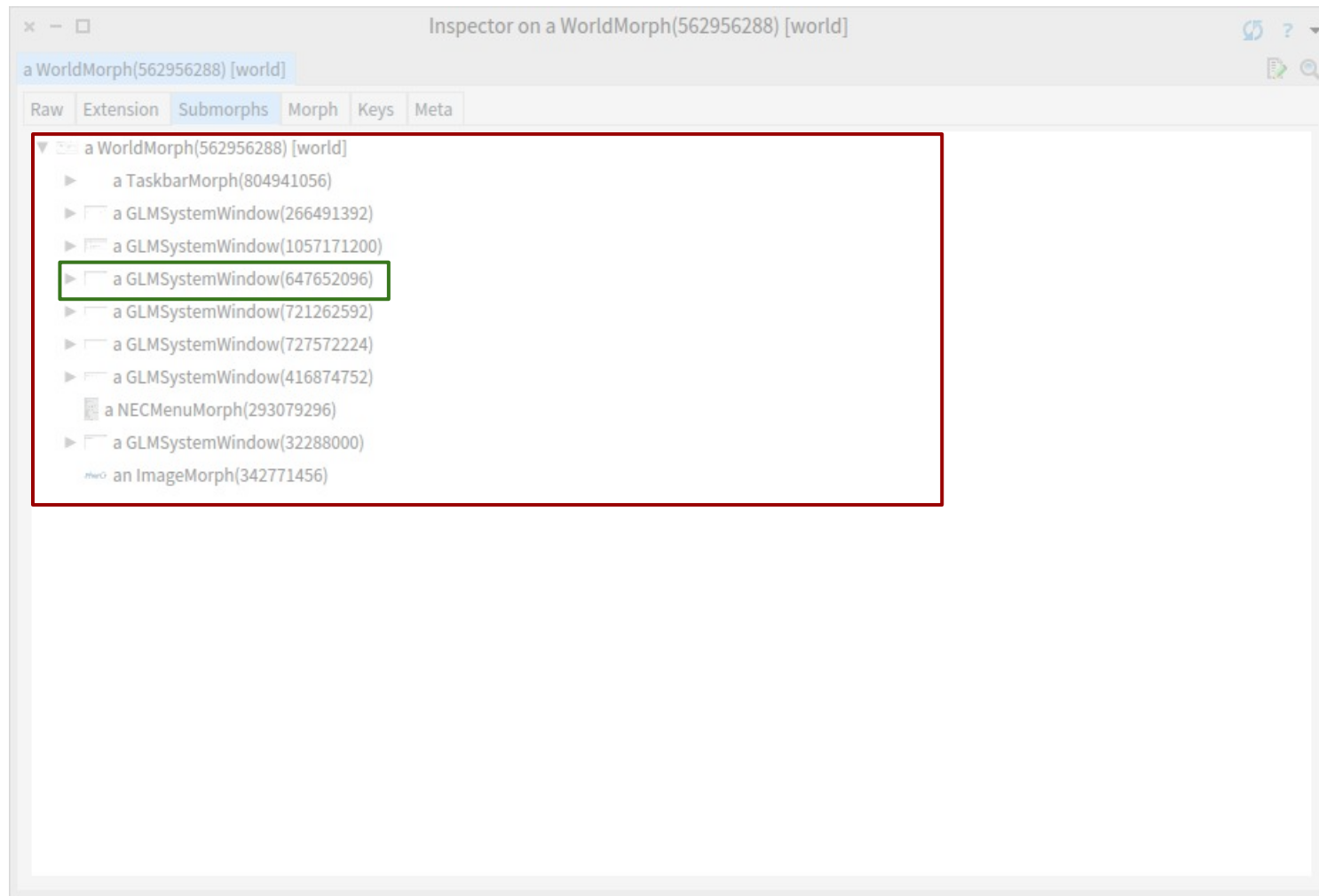
**Persist UI
element path**

.....> *CSS: n-th child*



Click events

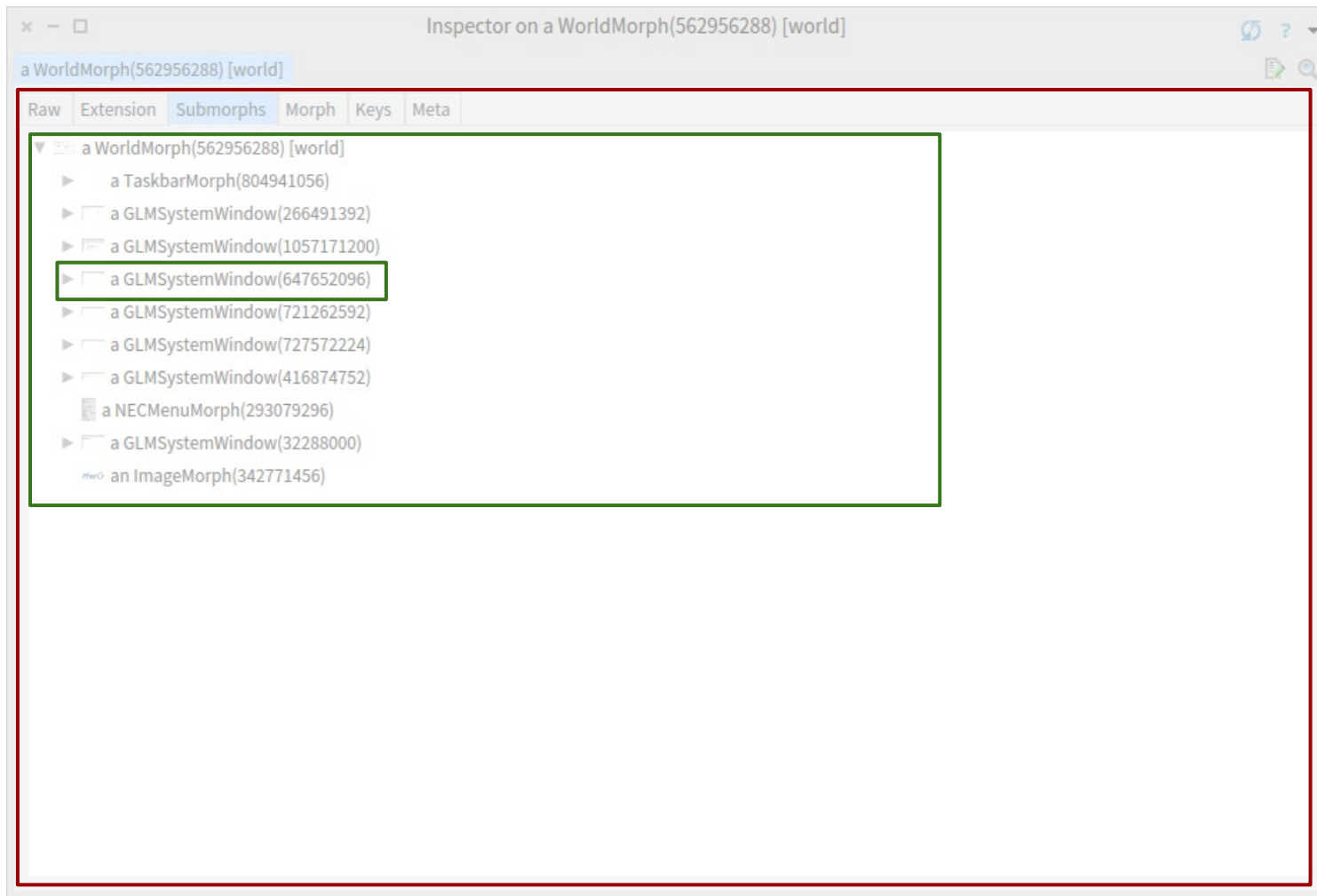
submorphAt: 4



Click events

submorphAt: 4

childAt: 1

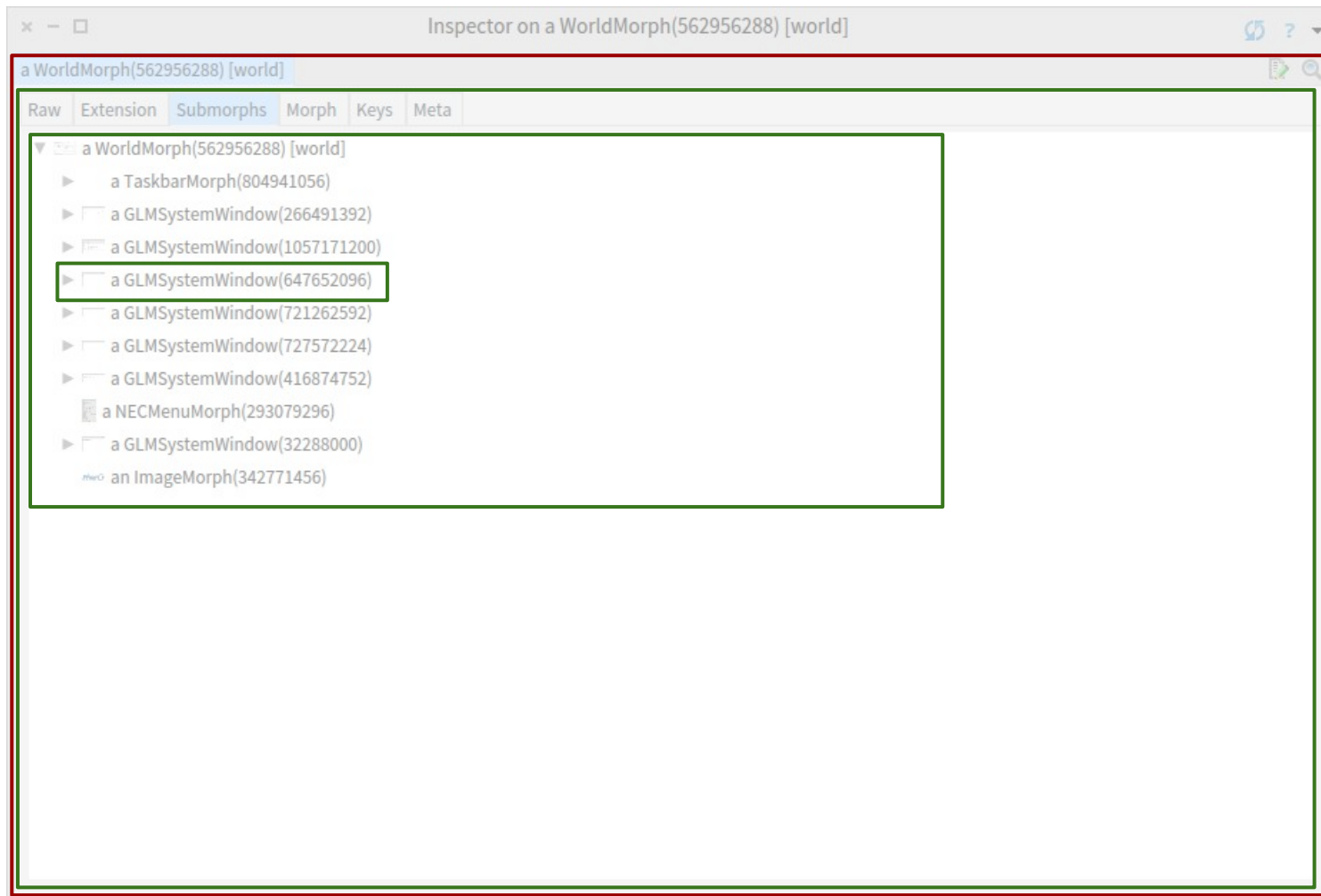


Click events

submorphAt: 4

childAt: 1

tabAt: 3



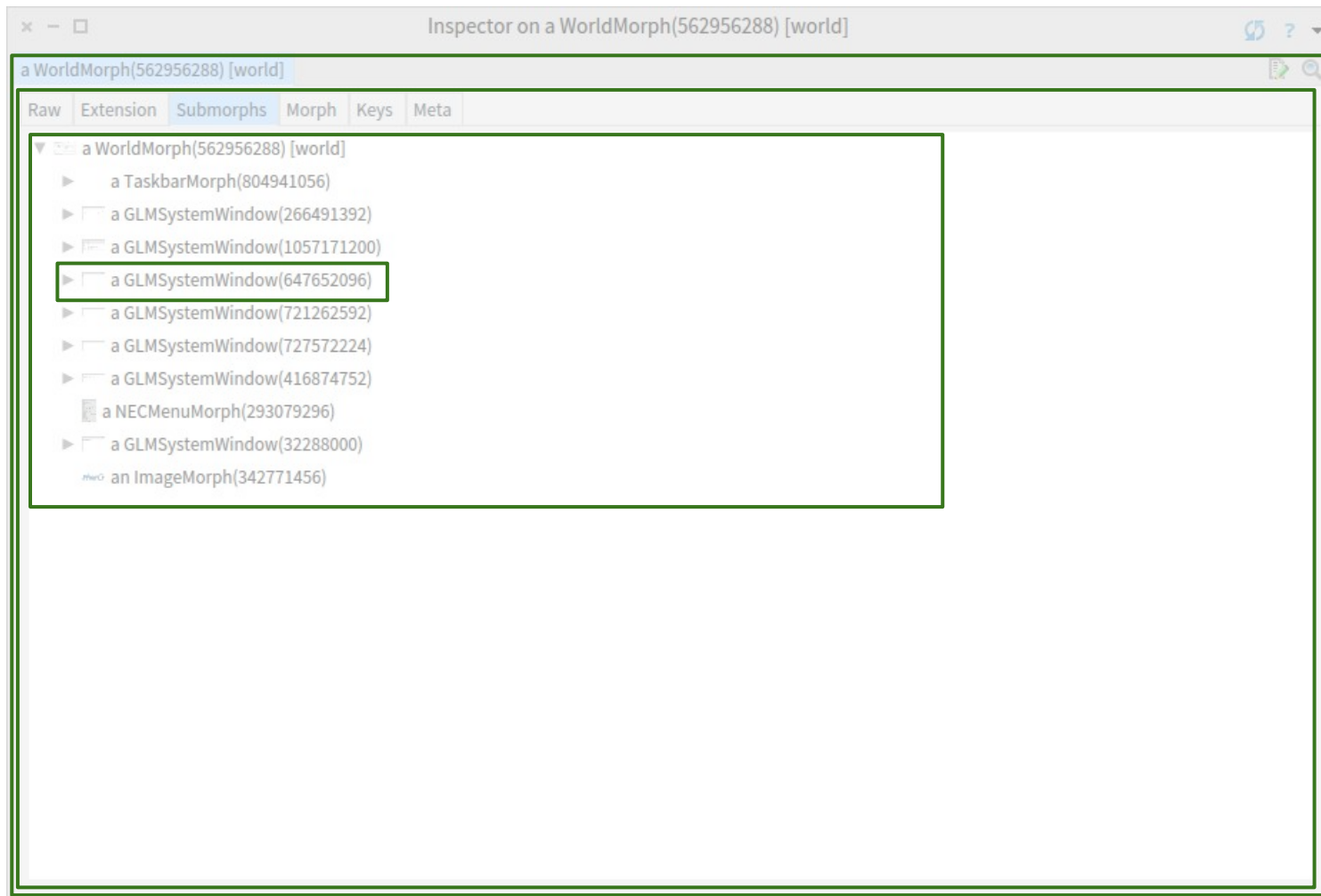
Click events

submorphAt: 4

childAt: 1

tabAt: 3

paneAt: 1



Click events

submorphAt: 4

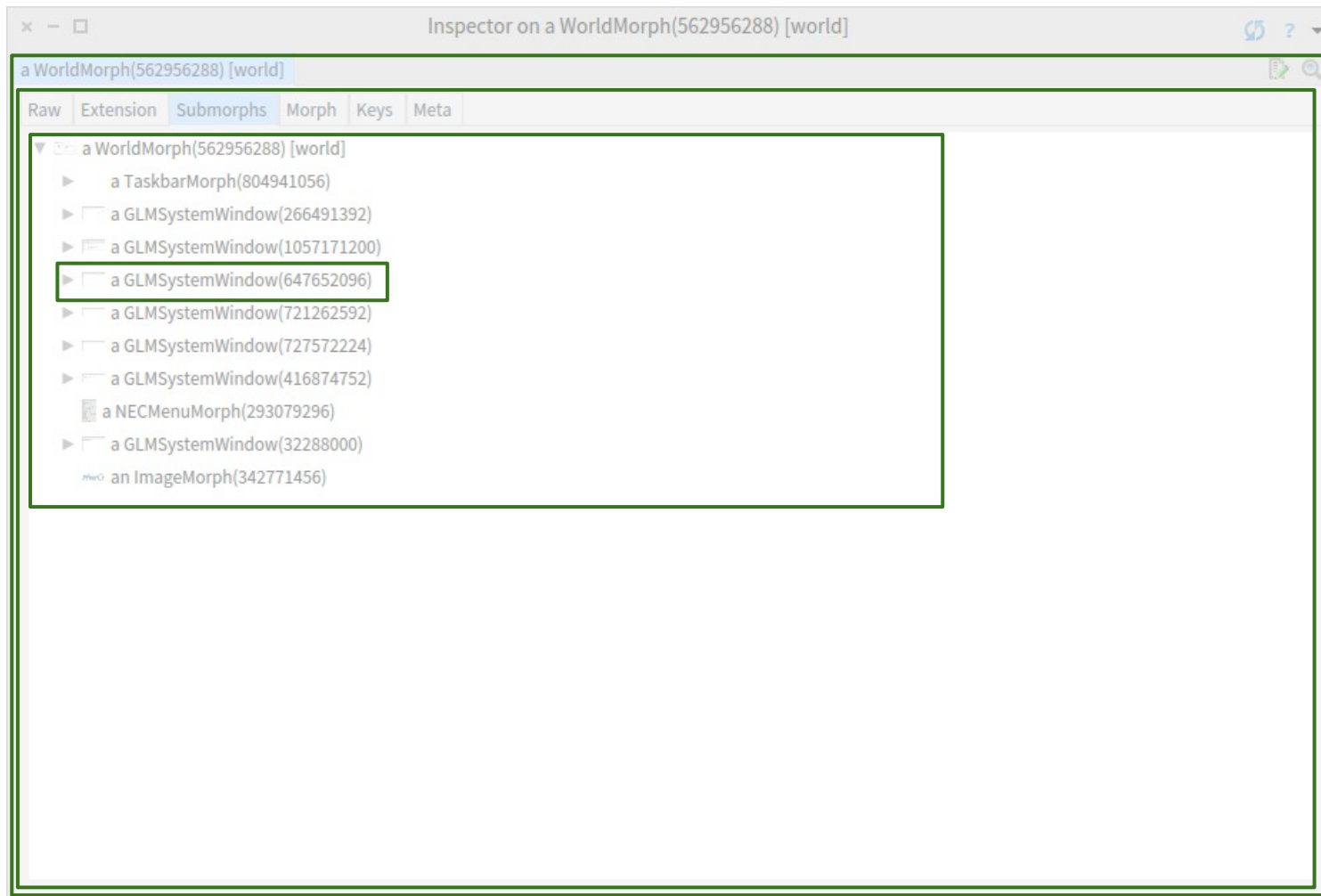
childAt: 1

tabAt: 3

paneAt: 1



Persist customized
UI element path



Click events

submorphAt: 4

childAt: 1

tabAt: 3

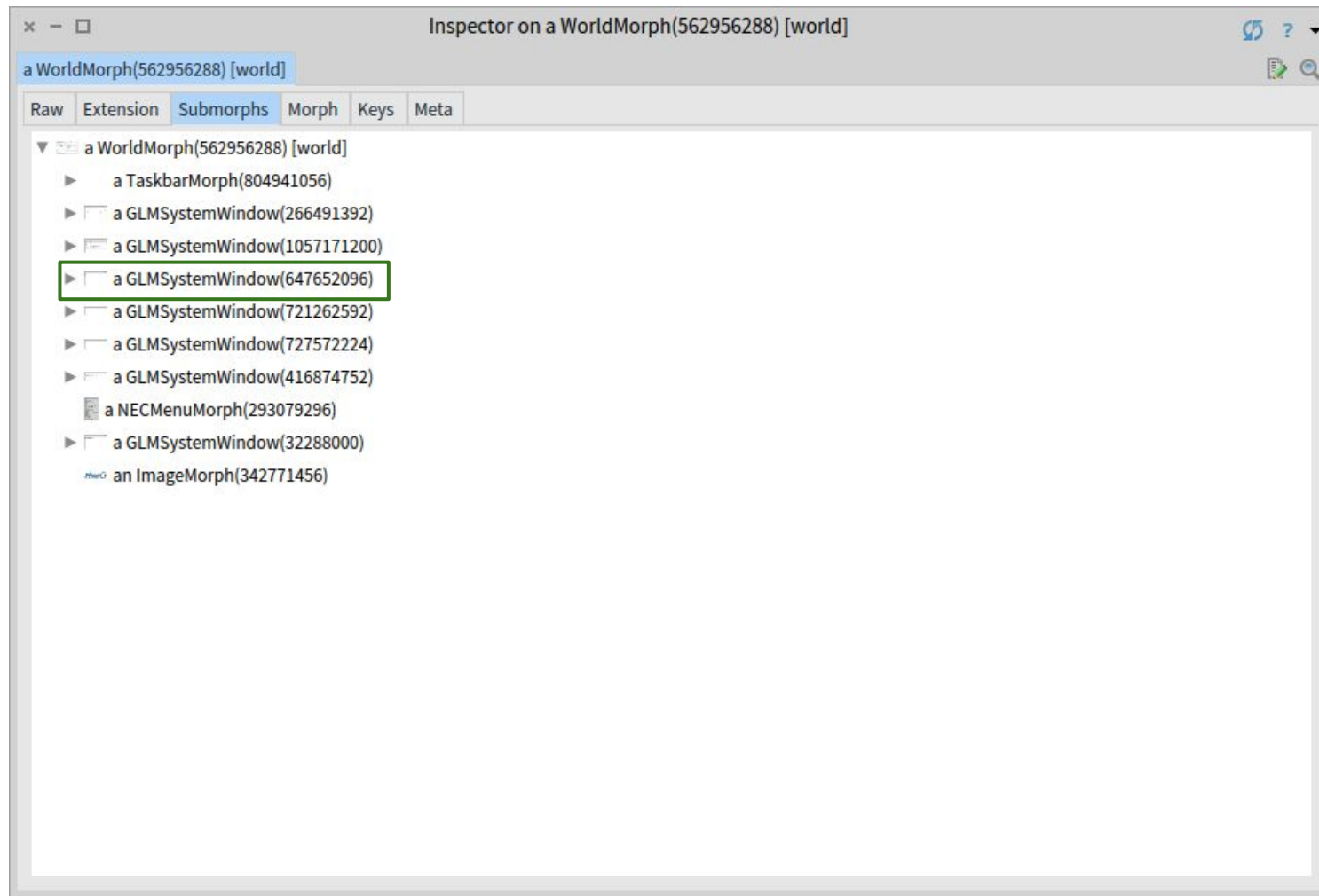
paneAt: 1



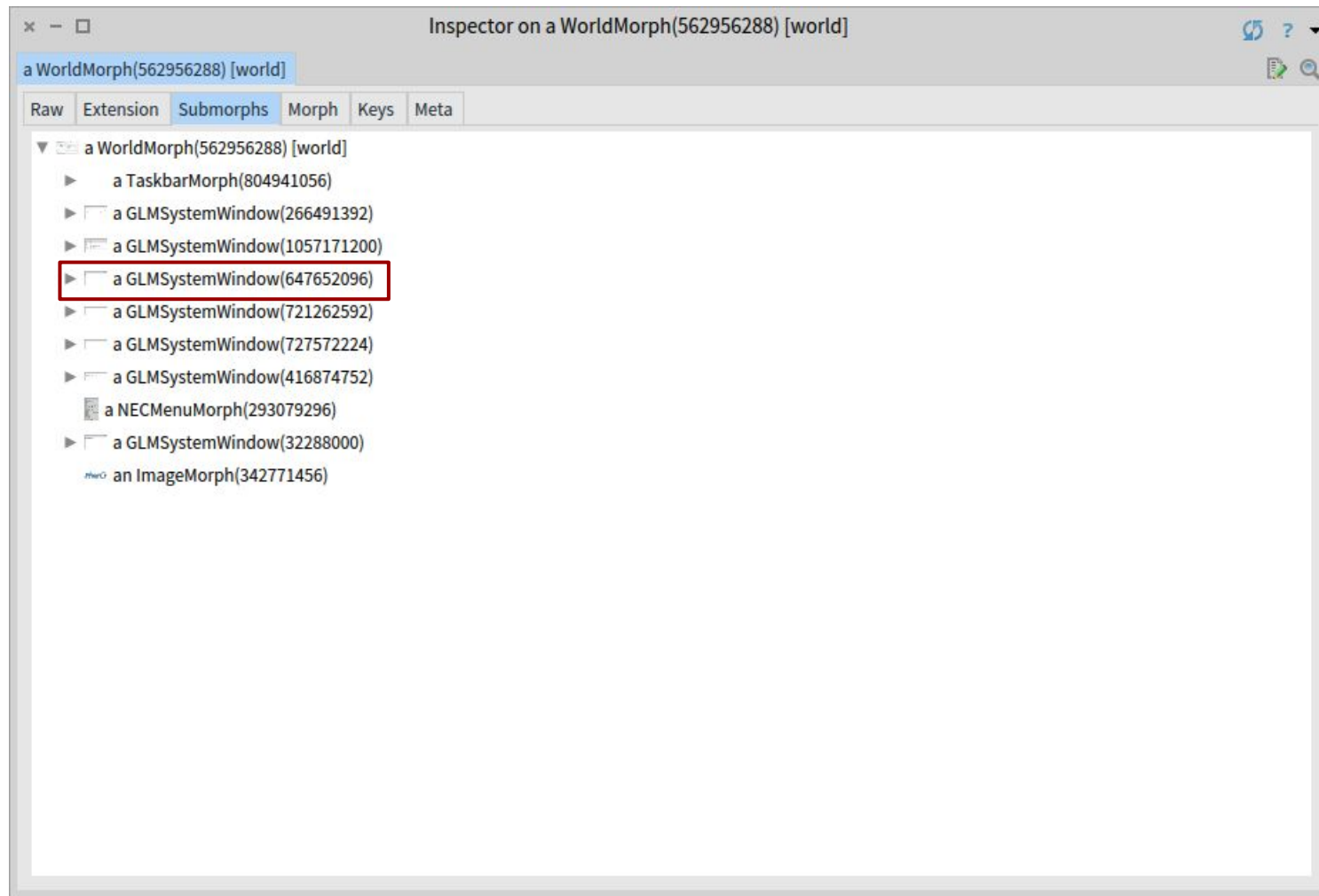
**Persist customized
UI element path**



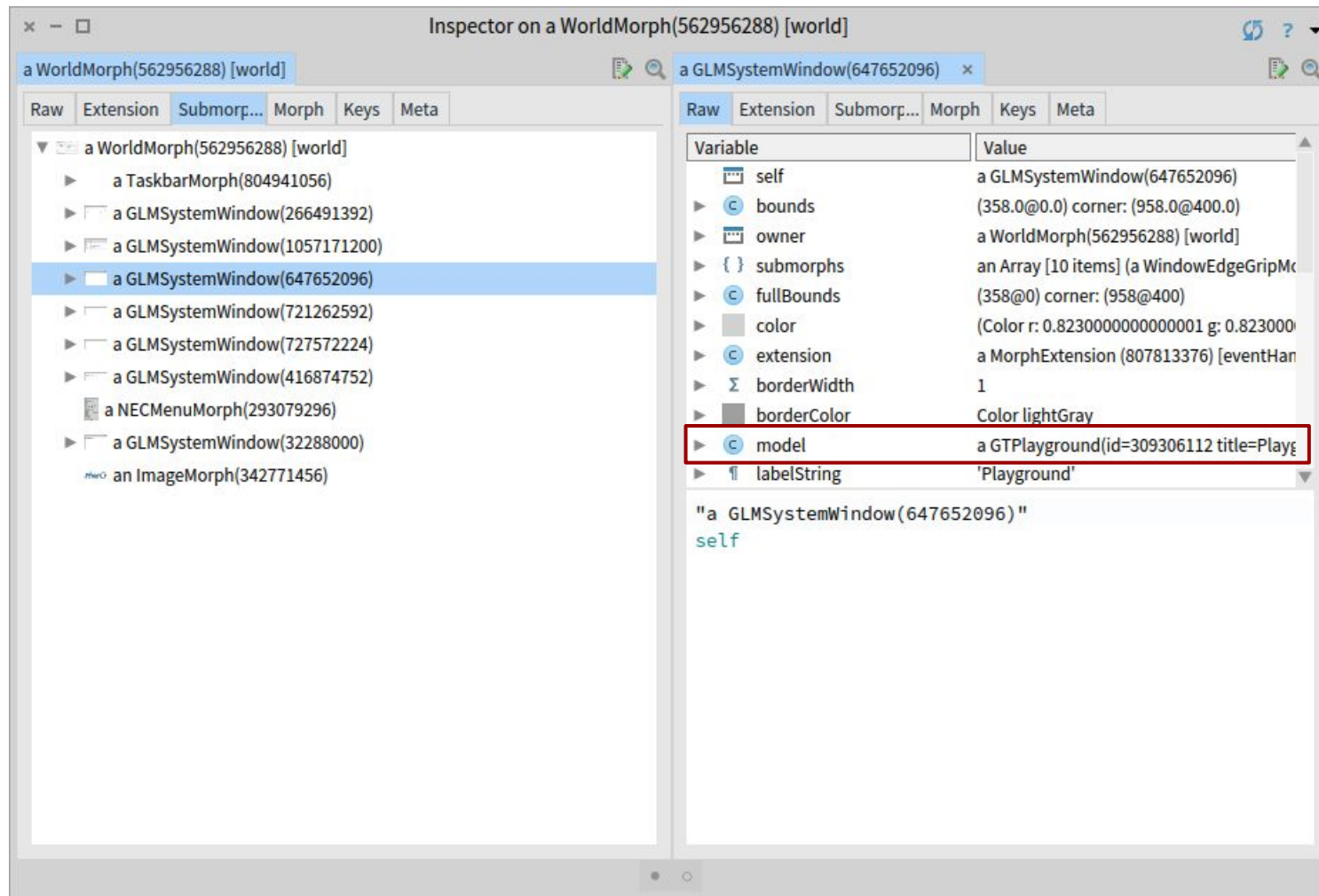
*fallback to childAt: if
no customization
available*



submorphAt: 4

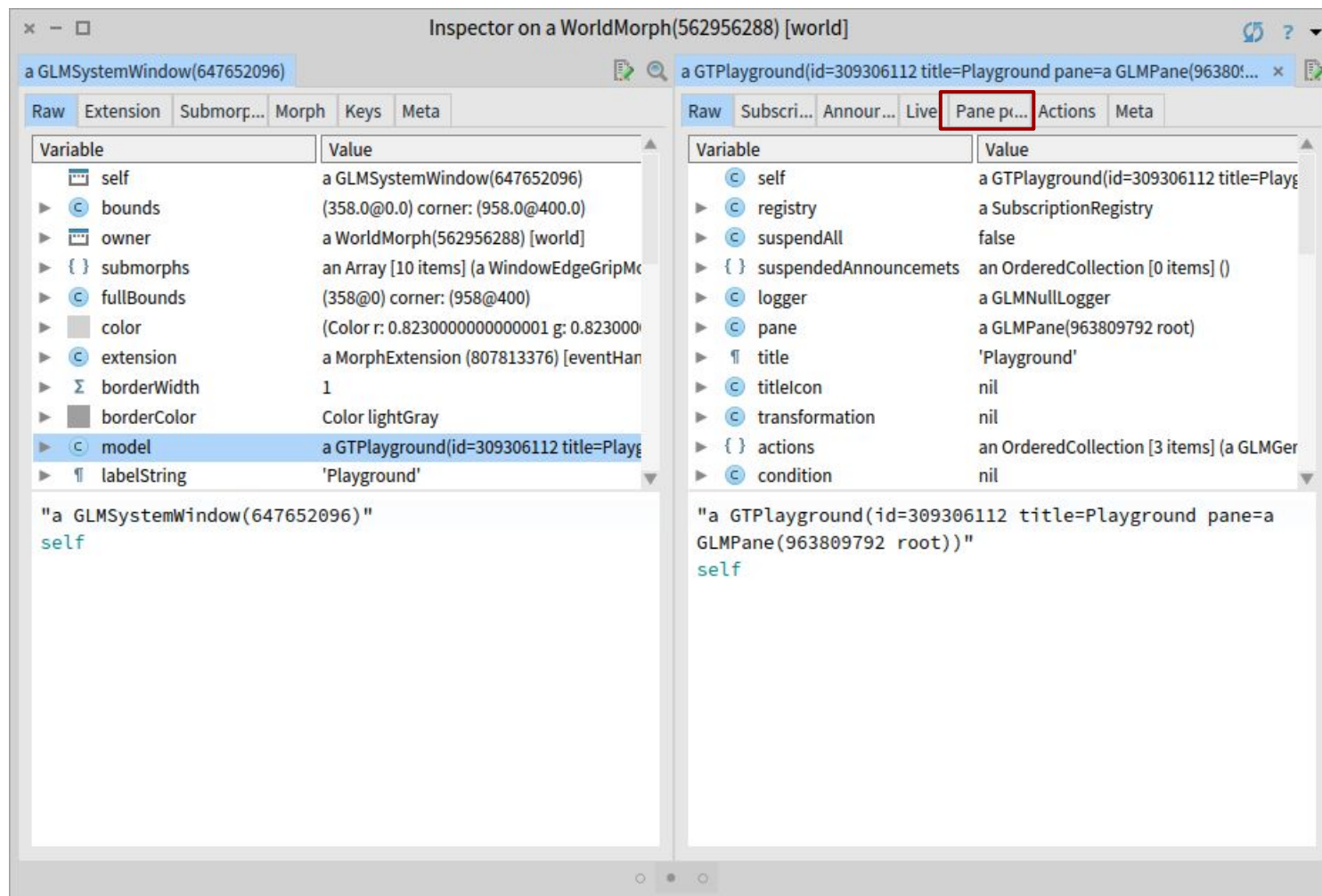


SubmorphSelection: 4



SubmorphSelection: 4

AttributeSelection: #model



SubmorphSelection: 4

AttributeSelection: #model

PresentationSelection: 'Ports'

Inspector on a WorldMorph(562956288) [world]

a GLMSystemWindow(647652096)

Raw Extension Submorph... Morph Keys Meta

Variable	Value
self	a GLMSystemWindow(647652096)
bounds	(358.0@0.0) corner: (958.0@400.0)
owner	a WorldMorph(562956288) [world]
submorphs	an Array [10 items] (a WindowEdgeGripM...
fullBounds	(358@0) corner: (958@400)
color	(Color r: 0.8230000000000001 g: 0.8230000...
extension	a MorphExtension (807813376) [eventHan
borderWidth	1
borderColor	Color lightGray
model	a GTPlayground(id=309306112 title=Playg
labelString	'Playground'

"a GLMSystemWindow(647652096)"

self

a GTPlayground(id=309306112 title=Playground pane=a GLMPane(963801... x

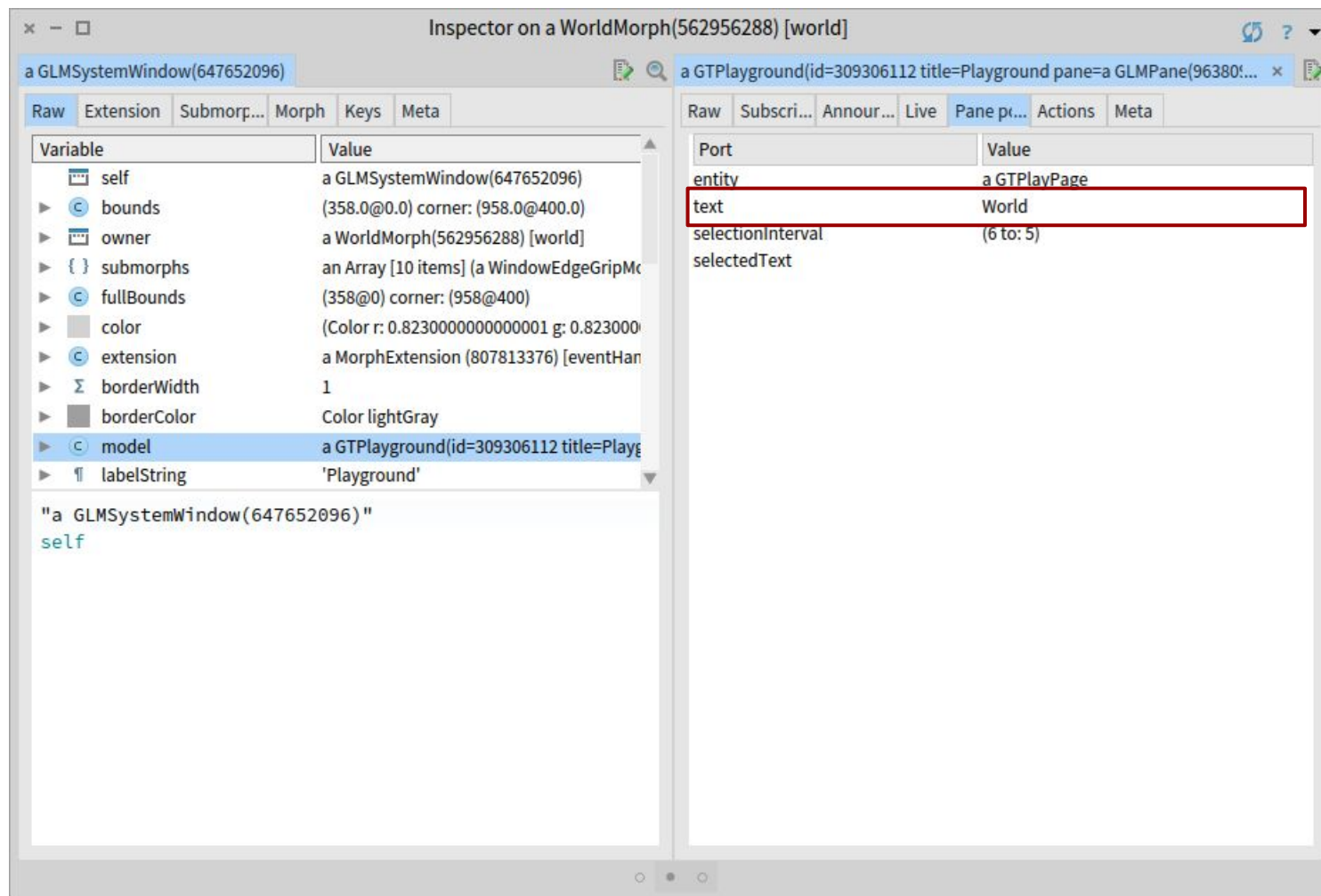
Raw Subscri... Annour... Live Pane p... Actions Meta

Port	Value
entity	a GTPlayPage
text	World
selectionInterval	(6 to: 5)
selectedText	

SubmorphSelection: 4

AttributeSelection: #model

PresentationSelection: 'Ports'



SubmorphSelection: 4

AttributeSelection: #model

PresentationSelection: 'Ports'

PortSelection: #text

Inspector on a WorldMorph(562956288) [world]

a GTPlayground(id=309306112 title=Playground pane=a GLMPane(963809792 ...)

a GLMPanePort (Port (pane='root' name=#text value=a Text for 'World'))

Port	Value
entity	a GTPlayPage
text	World
selectionInterval	(6 to: 5)
selectedText	

Variable	Value
self	Port (pane='root' name=#text value=a Text for 'World')
registry	a SubscriptionRegistry
suspendAll	nil
suspendedAnnouncemets	nil
logger	a GLMNullLogger
name	#text
pane	a GLMPane(963809792 root)
{ } value	a Text [5 items] (\$W \$o \$r \$l \$d)

```
"Port (pane='root' name=#text value=a Text for 'World')"  
self
```

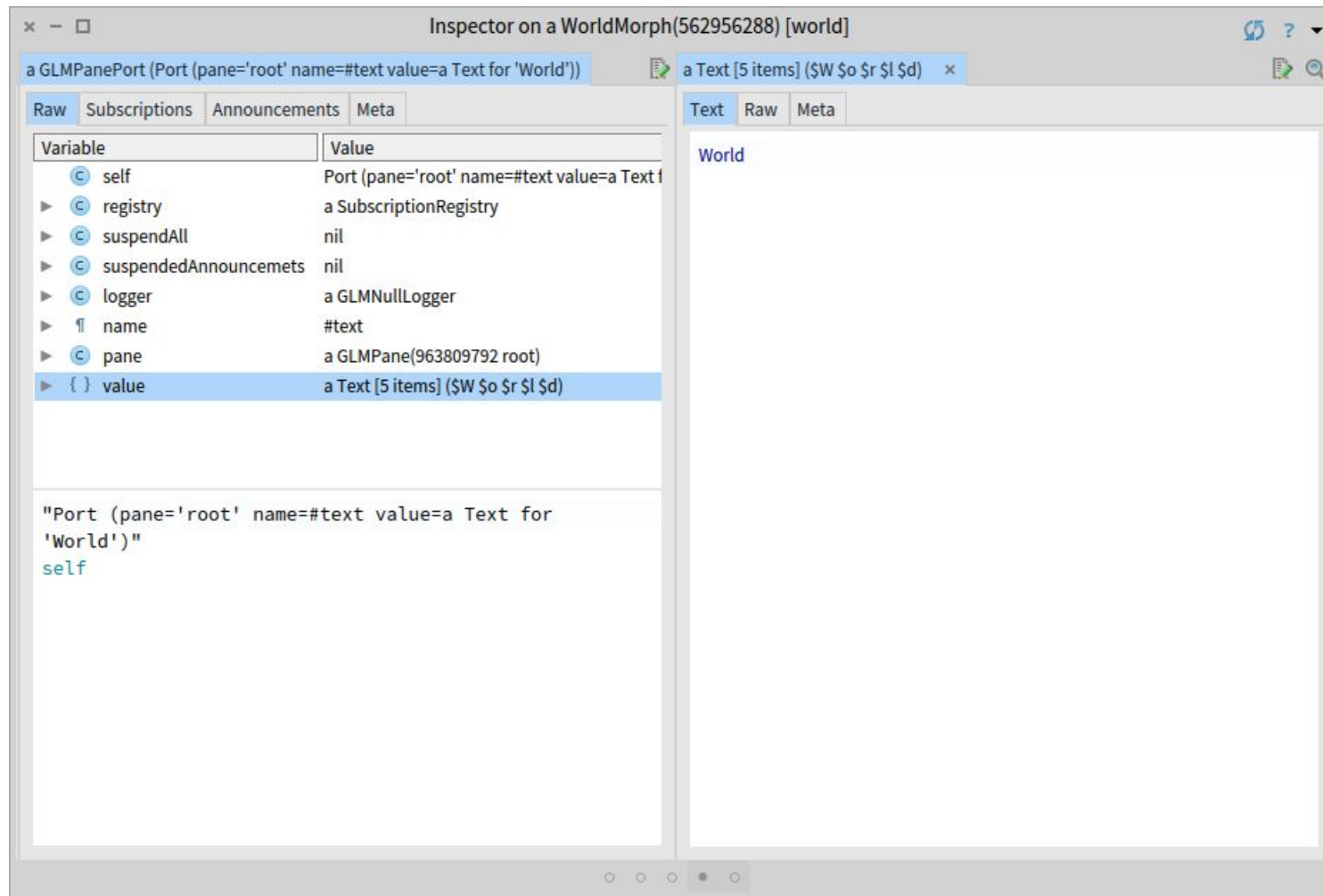
SubmorphSelection: 4

AttributeSelection: #model

PresentationSelection: 'Ports'

PortSelection: #text

AttributeSelection: #value



SubmorphSelection: 4

AttributeSelection: #model

PresentationSelection: 'Ports'

PortSelection: #text

AttributeSelection: #value

We need here a plus/minuses slide

SubmorphSelection: 4

AttributeSelection: #model

The screenshot shows the Inspector on a WorldMorph(562956288) [world]. The left panel shows a tree view of the WorldMorph's submorphs. The middle panel shows the properties of the selected GLMSystemWindow(647652096). The right panel shows the properties of the selected GTPlayground(id=309306112 title=Playground pane=a GLMPan...).

Variable	Value
self	a GLMSystemWindow(647652096)
bounds	(358.0@0.0) corner: (958.0@400)
owner	a WorldMorph(562956288) [world]
submorphs	an Array [10 items] (a WindowMorph, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow, a GLMSystemWindow)
fullBounds	(358@0) corner: (958@400)
color	(Color r: 0.8230000000000000)
extension	a MorphExtension (80781337)
borderWidth	1
borderColor	Color lightGray
model	a GTPlayground(id=309306112 title=Playground pane=a GLMPan...)
labelString	'Playground'

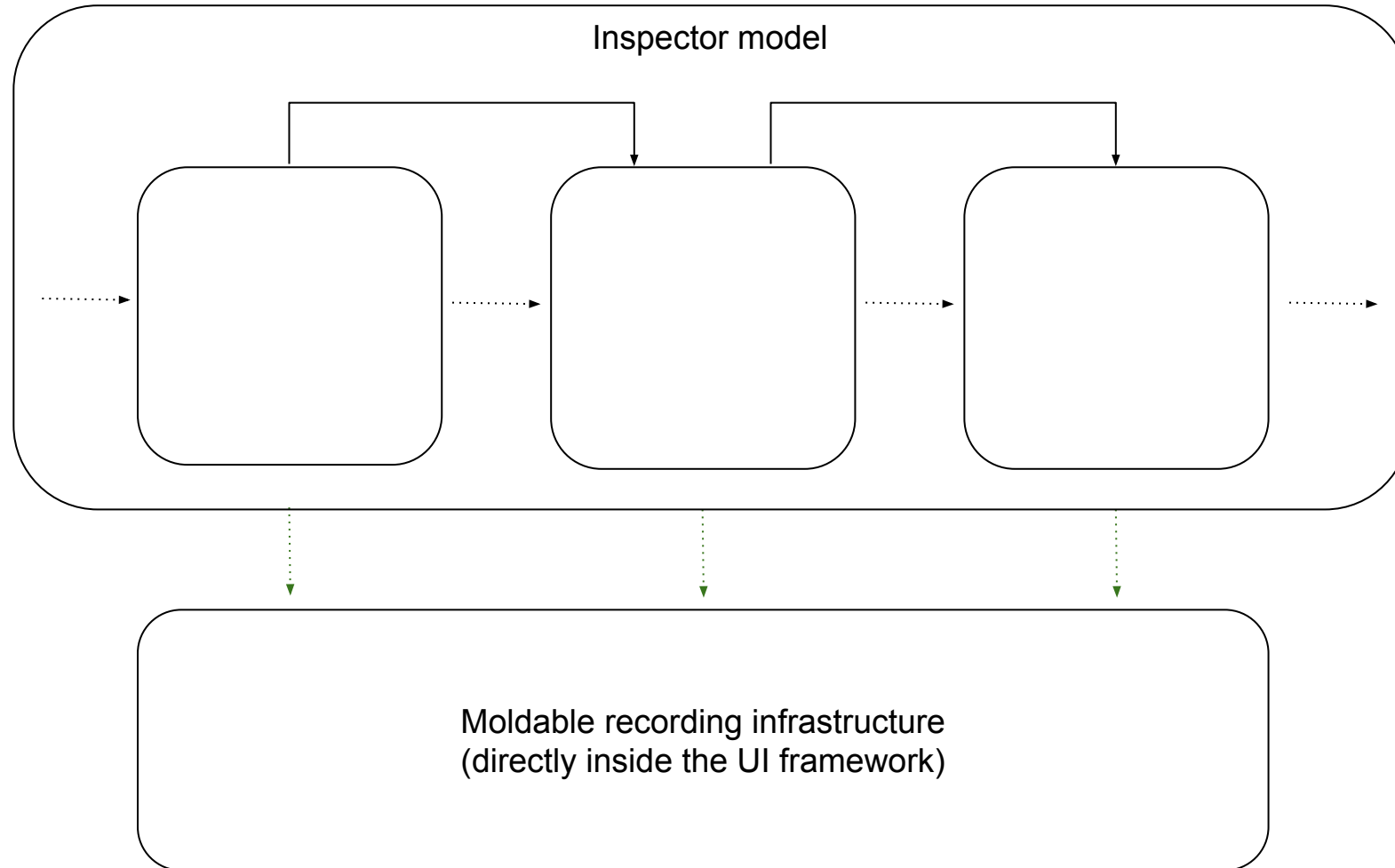
"a GLMSystemWindow(647652096)"
self

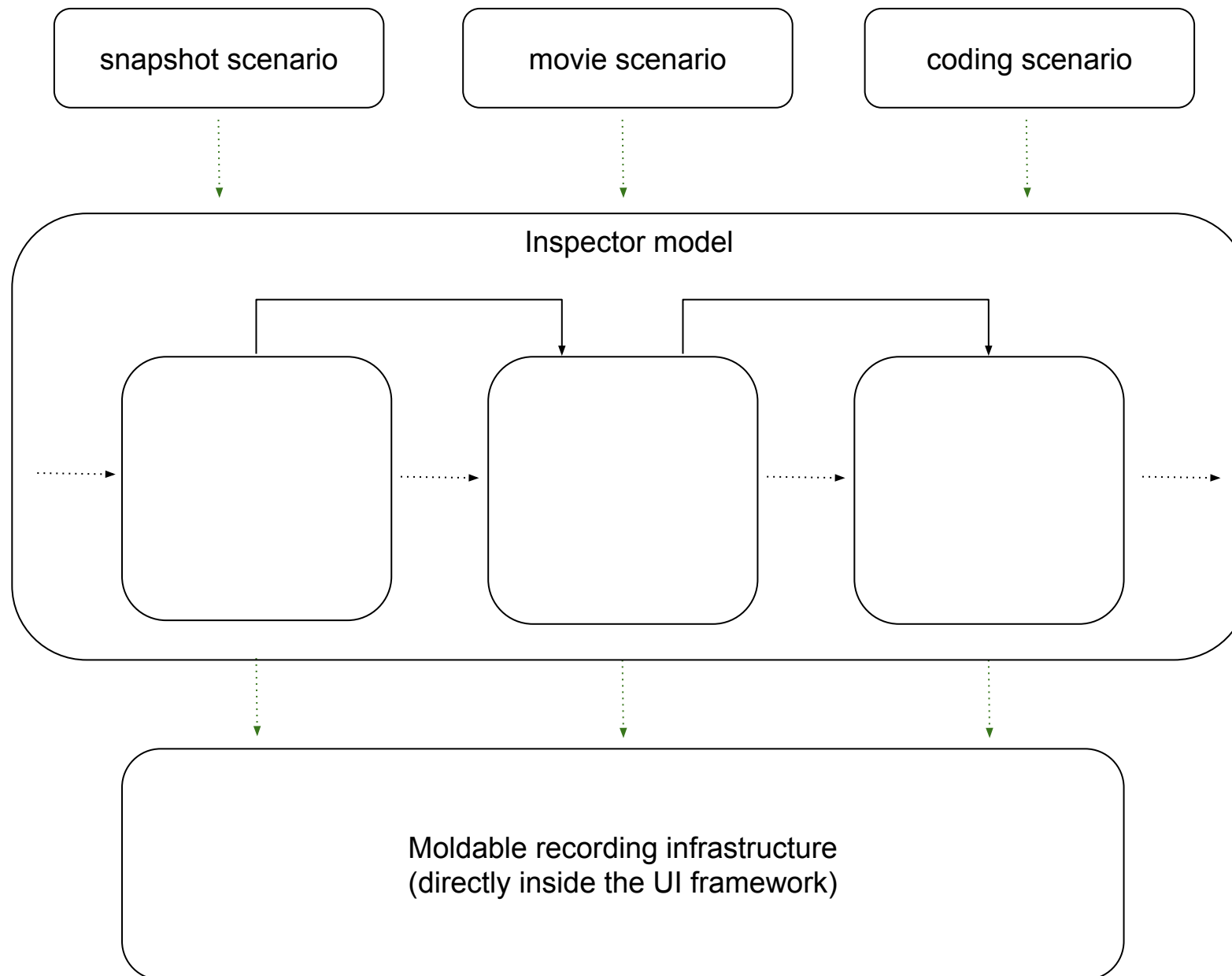
Port	Value
entity	a GTPlayPage
text	World
selectionInterval	(6 to: 5)
selectedText	

PresentationSelectionAction
CollapseAction

HideAction

PresentationSelectionAction





FolderSelection: main

ArchiveSelection: archive.zip

FileInArchiveSelection:
pharo-city.png

Inspector on a FileReference (/data)

a FileReference (/data)

Name	Size
archive	224 B
web	64 B
image	160 B
current	288 B
stash	64 B
scripts	128 B
main	288 B
images.zip	577 B
pharo-ui	371 B
photos.zip	157.78 kB
.DS_Store	12.29 kB
web.zip	569 B
script.st	56 B
pharo-city.png	136.55 kB
Workspace.st	73 B
pharo	382 B
graph.png	18.62 kB
files.st	358 B
vizualization.png	5.88 kB
img2.png	8.62 kB
Debug.log	1.41 MB
flower.png	11.09 kB

a FileReference (/data/main)

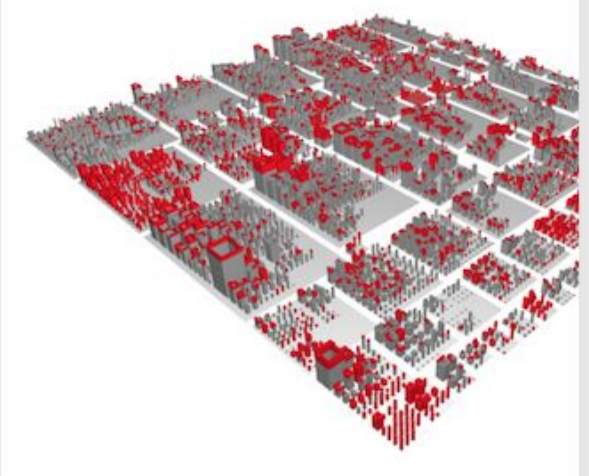
Name	Size
..	992 B
cache	64 B
current	288 B
.DS_Store	6.15 kB
files.st	358 B
Debug.log	1.41 MB
cache.zip	577 B
archive.zip	160.44 kB

a FileReference (/data/main/archive.zip)

Name	Size
..	288 B
__MACOSX	0 B
README.txt	0 B
flower.png	0 B
pharo-city.png	0 B
pharo-graph.png	0 B
sample-xml.xml	0 B

a FileReference (/pharo-city.png)

Picture



CategorySelection:
Mondrian

ExampleSelection:
InnerAndPopup

MethodSelection:
RTArc>>#initialize

Roassal examples browser

Dynamic stack grapher
Experimental
Explora
Geographical maps
Gradient and multi colored lines
Grapher - Bar charts
Grapher - Decoration
Grapher - Overall
Grapher - Scatterplots
Interaction
Kiviat (Radar)
Layout
Legend
Line decoration
Map location
Mondrian
Name cloud
OpenStreetMap Integration
Pie chart
Plain Roassal
SVG
Selection Elements
Sparkline
Spectrograph

a RTMondrianExample

Examples Raw Meta

a RTExampleSelection (RTMondrianExamp...

Canvas Playground Raw

a CompiledMethod (RTArc>>#initialize)

Raw Byte... Source Ir AST Head... Meta

```
initialize
  super initialize.
  self alphaAngle: 0.
  self betaAngle: 35.
  self innerRadius: 30.
  self externalRadius: 50.
```

ModelSelection:
Glamour

Query::
#allClasses

ClassSelection:
GLMAAction

CodeQuery

Moose Panel

Models

GlamourModel

GlamourModel (MooseModel)

All model classes (473) (FAMIXClassGroup)

Smalltalk::GLMAAction (FAMIXClass)

an OrderedCollection [24 items] (GLMAAction>>ci...

All attributes - All famixattributes (2038)

All classes - All famixclasses (851)

All comments - All famixcomments (1413)

All global variables - All famixglobalvariable

All implicit variables - All famiximplicitvarial

All inheritances - All famixinheritances (850)

All invocations - All famixinvocations (33840)

All local variables - All famixlocalvariables (:

All methods - All famixmethods (5333)

All model classes - All model classes (473)

All model methods - Group (5249)

All model namespaces - Smalltalk

All model packages - All model packages (2)

All model types - All model types (488)

All namespaces - All famixnamespaces (2)

All packages - All famixpackages (109)

All parameters - All famixparameters (3066)

All references - All famixreferences (2972)

Smalltalk::AthensBalloonGradientPaint

Smalltalk::AthensBalloonImagePaint

Smalltalk::AthensBalloonLinearGradient

Smalltalk::AthensBalloonPaint

Smalltalk::AthensBalloonPath

Smalltalk::AthensBalloonRadialGradient

Smalltalk::AthensBalloonSolidColorPaint

Smalltalk::AthensBalloonStrokePaint

Smalltalk::AthensBalloonSurface

Smalltalk::FT2GlyphRenderer

Smalltalk::GLMAbstractWizardStep

Smalltalk::GLMAccordionArrangement

Smalltalk::GLMAccumulator

Smalltalk::GLMAccumulatorMorphicTest

Smalltalk::GLMAccumulatorTest

Smalltalk::GLMAAction

Smalltalk::GLMAActionAnnouncement

Smalltalk::GLMAActionBrickDarkThemer

Smalltalk::GLMAActionBrickPopupThemer

Smalltalk::GLMAActionBrickThemer

Smalltalk::GLMAActionButtonBrick

Smalltalk::GLMAActionListPresentation

```
self methods select: [ :m |  
  m outgoingInvocations size > 0 ]
```

Smalltalk::GLMAAction.condition()

Smalltalk::GLMAAction.installKeyCombinatic

Smalltalk::GLMAAction.separatorBefore()

Smalltalk::GLMAAction.hasTitle()

Smalltalk::GLMAAction.shortcutAsString()

Smalltalk::GLMAAction.gtDisplayOn:(Object)

Smalltalk::GLMAAction.separatorAfter()

Smalltalk::GLMAAction.hasShortcut()

Smalltalk::GLMAAction.shortcut()

Smalltalk::GLMAAction.shortcut:(Object)

Smalltalk::GLMAAction.iconName:(Object)

Smalltalk::GLMAAction.isMenu()

Smalltalk::GLMAAction.isCategorized()

Smalltalk::GLMAAction.actOn:(Object)

Smalltalk::GLMAction.isAvailableOn:(Object)

Smalltalk::GLMAAction.withSeparatorBefore

Smalltalk::GLMAAction.enabledCondition()

Smalltalk::GLMAAction.isFnaledOn:(Object)

A selection boolean statement using 'each' to ref

Models

GlamourModel

GlamourModel (MooseModel)

All model classes (473) (FAMIXClassGroup)

Smalltalk::GLMAAction (FAMIXClass)

an OrderedCollection [24 items] (GLMAAction>>ci...)

```

glamourModel := MooseModel root allModels detect: [ :each |
    each name = 'GlamourModel' ].
actionClass := glamourModel allModelClasses detect: [ :each |
    each name = 'GLMAAction' ].
methods := actionClass methods select: [ :m |
    m outgoingInvocations size > 0 ]

```

All methods - All famixmethods (5333)

All model classes - All model classes (473)

All model methods - Group (5249)

All model namespaces - Smalltalk

All model packages - All model packages (2)

All model types - All model types (488)

All namespaces - All famixnamespaces (2)

All packages - All famixpackages (109)

All parameters - All famixparameters (3066)

All references - All famixreferences (2972)

Smalltalk::GLMAbstractWizardStep

Smalltalk::GLMAccordionArrangement

Smalltalk::GLMAccumulator

Smalltalk::GLMAccumulatorMorphicTest

Smalltalk::GLMAccumulatorTest

Smalltalk::GLMAAction

Smalltalk::GLMAActionAnnouncement

Smalltalk::GLMAActionBrickDarkThemer

Smalltalk::GLMAActionBrickPopupThemer

Smalltalk::GLMAActionBrickThemer

Smalltalk::GLMAActionButtonBrick

Smalltalk::GLMAActionListPresentation

LMAction.condition()

LMAction.installKeyCombinatic

LMAction.separatorBefore()

LMAction.hasTitle()

LMAction.shortcutAsString()

LMAction.gtDisplayOn:(Object)

LMAction.separatorAfter()

LMAction.hasShortcut()

LMAction.shortcut()

Smalltalk::GLMAAction.shortcut:(Object)

Smalltalk::GLMAAction.iconName:(Object)

Smalltalk::GLMAAction.isMenu()

Smalltalk::GLMAAction.isCategorized()

Smalltalk::GLMAAction.actOn:(Object)

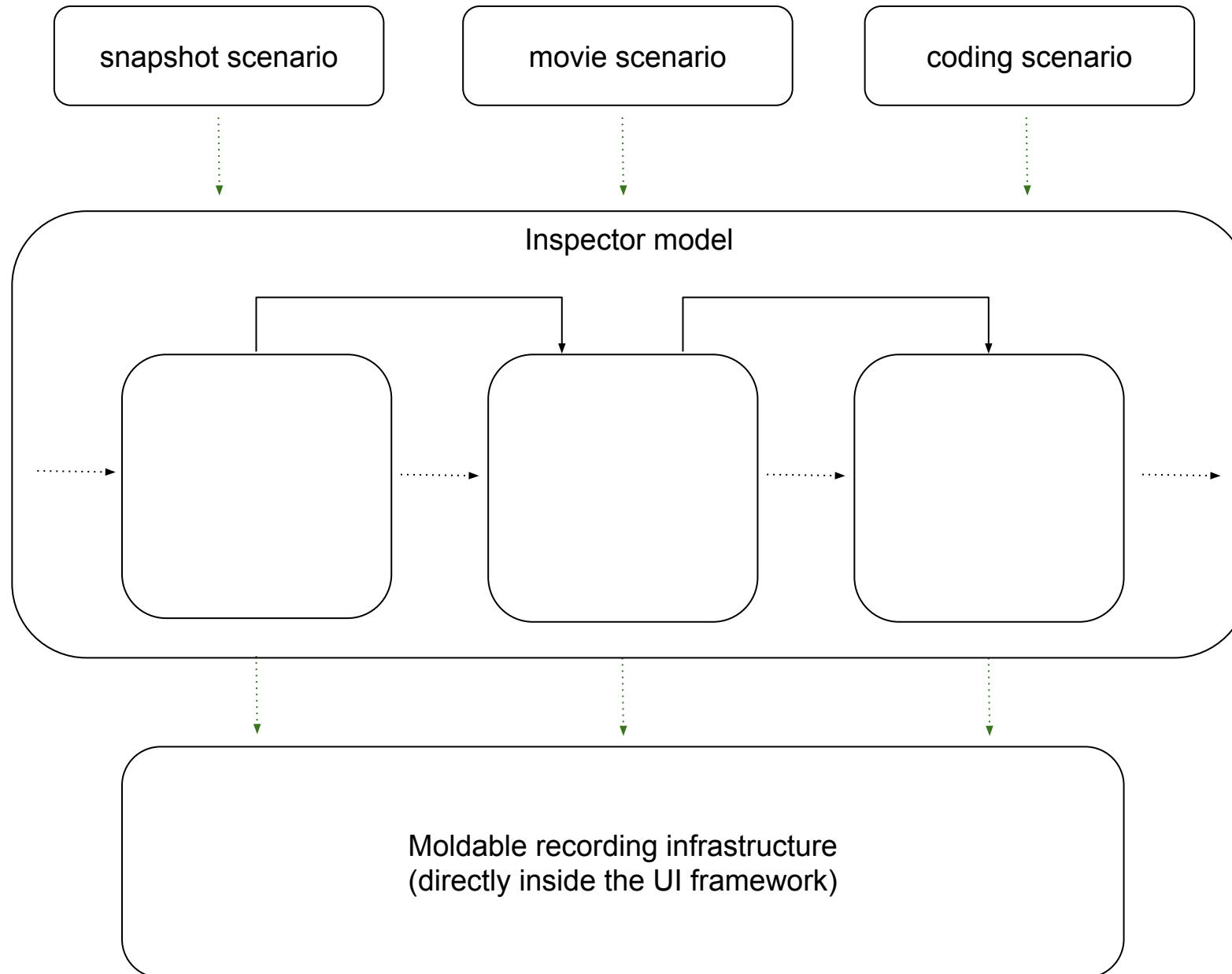
Smalltalk::GLMAAction.isAvailableOn:(Object)

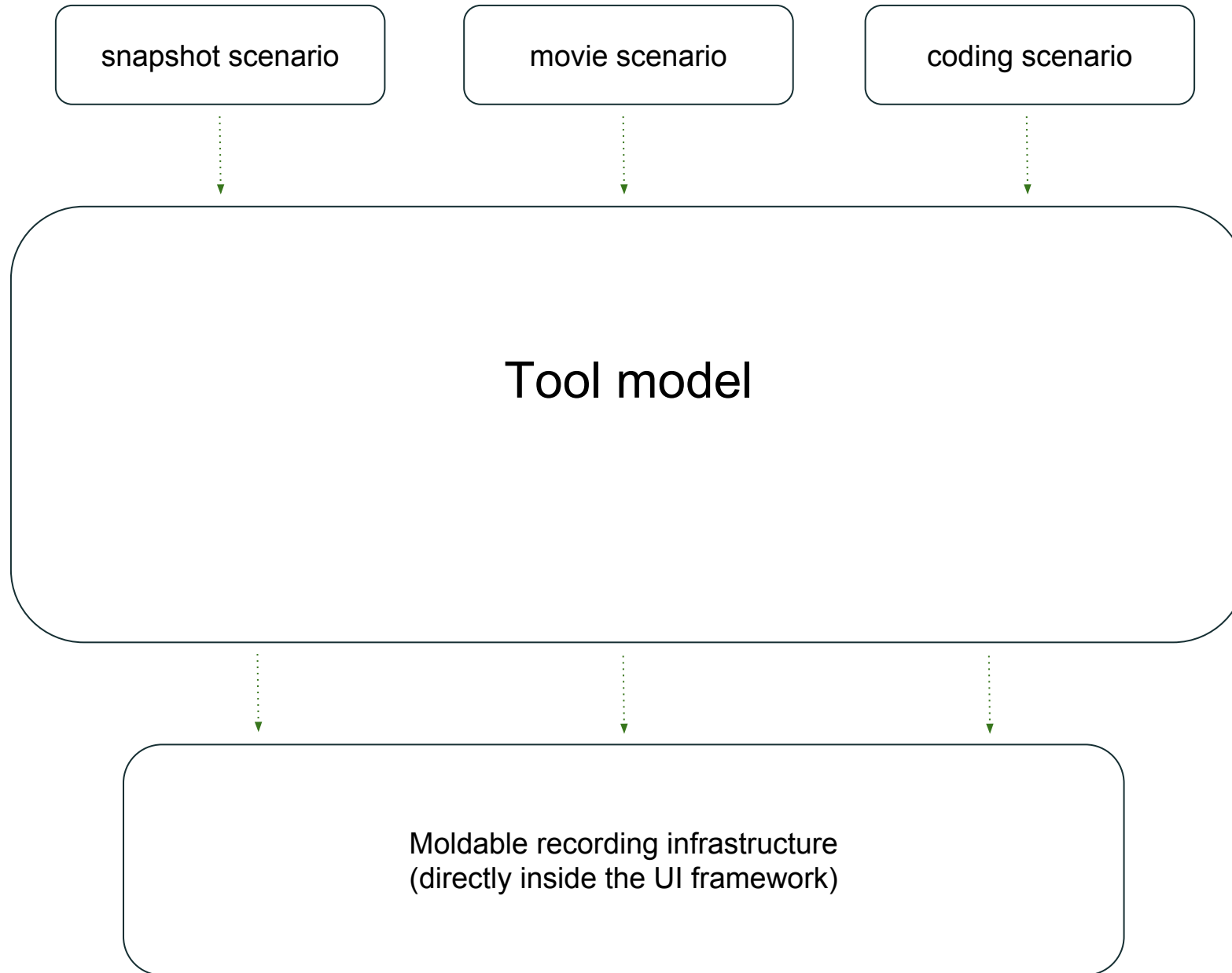
Smalltalk::GLMAAction.withSeparatorBefore

Smalltalk::GLMAAction.enabledCondition()

Smalltalk::GLMAAction.isEnabledOn:(Object)

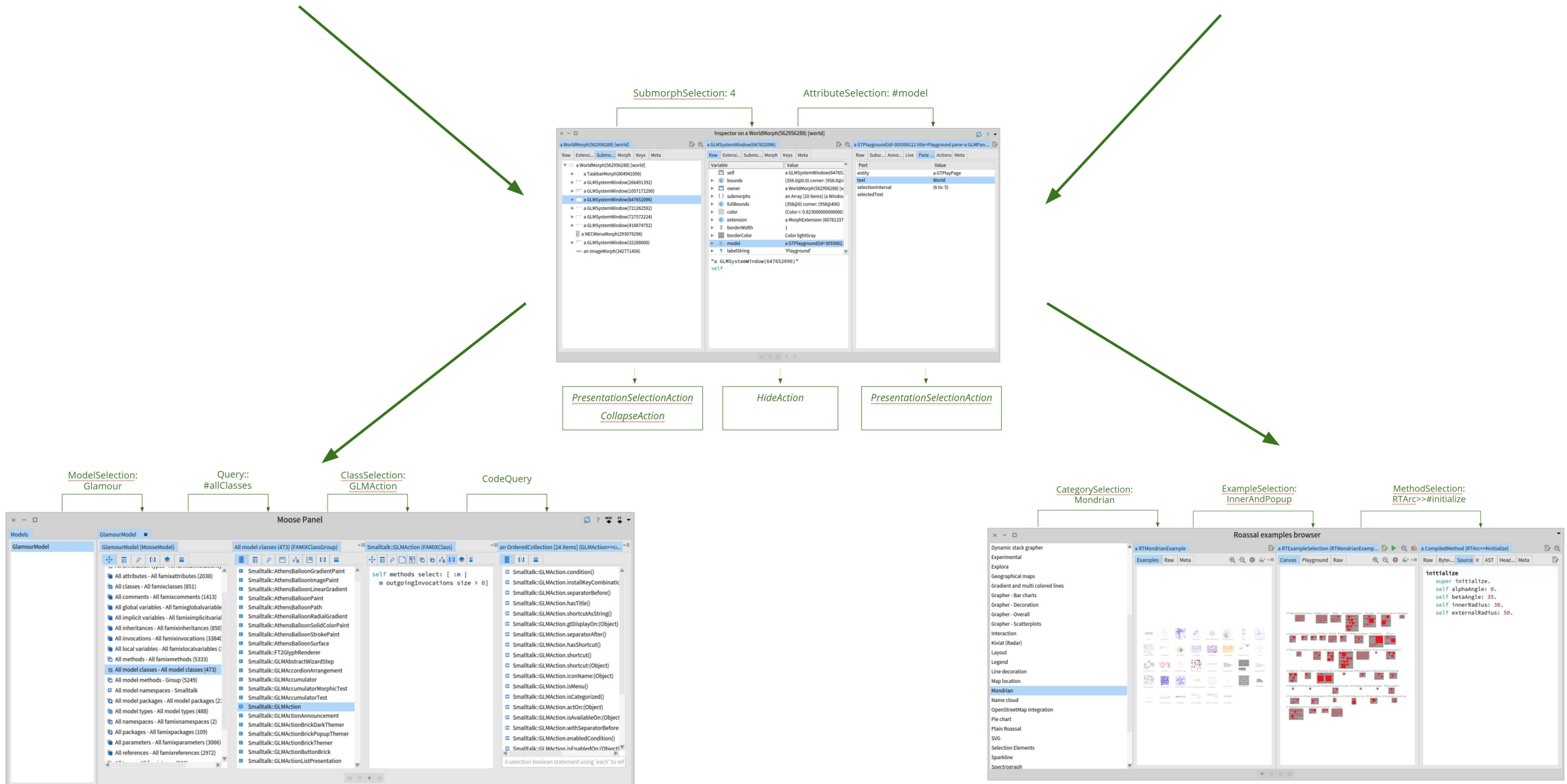
A selection boolean statement using 'each' to ref





UI Recording

Serialization



Current state

DEMO

Future work

Custom recording steps

Integration in the inspector

Experimental scenarios
(snapshot, movie,
code generation)

Thesis writing

Challenges

Pharo/Bloc

Complete redesign
of the Inspector

Usability

Thesis writing

Summary

Manually redoing inspection sessions makes developers waste time during development

Allow graphical objects to decide how interactions will be recorded (fall back to #childAt:)

