

2025 Soar Update

9.6.1 – 9.6.3 and beyond



**Center for
Integrated
Cognition**

Nathan Glenn



About me

- BYU undergrad, worked on XNL-Soar
- Software Engineer since 2007
- Previous post at trivago, N.V. (Düsseldorf, Germany)
- With CIC for the past 2 years



garfieldnate

Comment out debug console ...





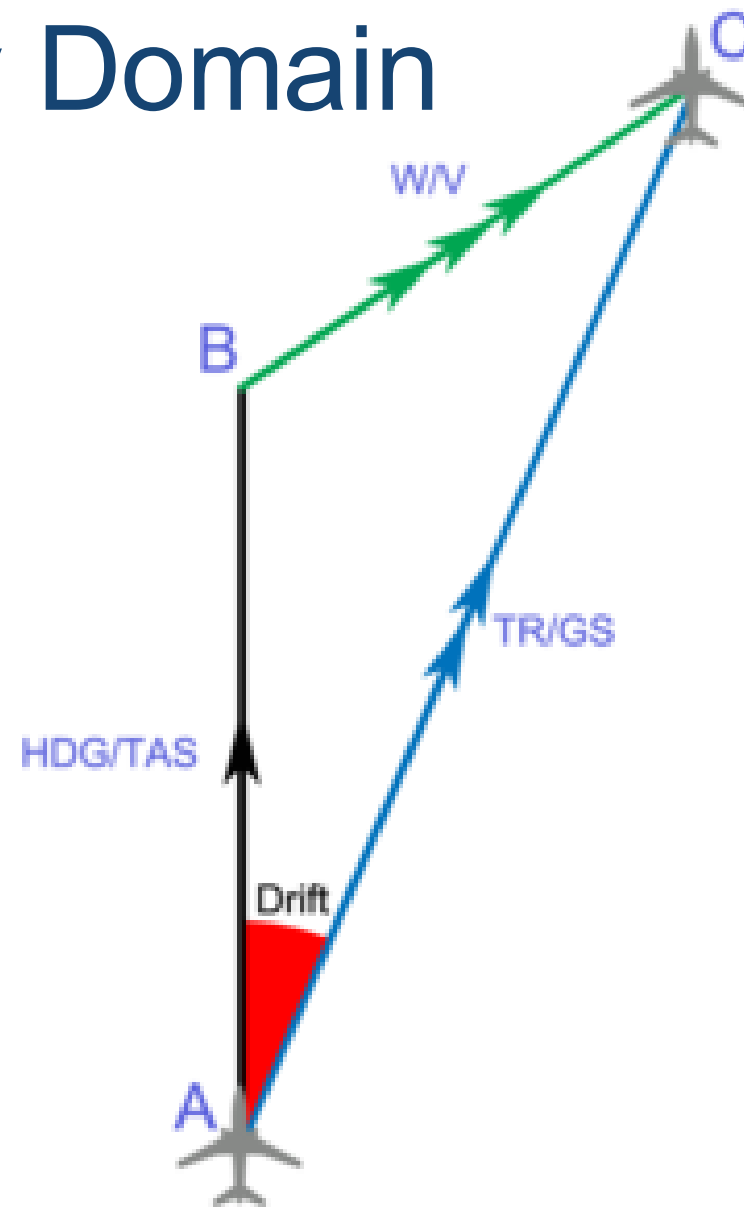
Timeline

- 9.6.1: December 2022
- 9.6.2: March 2024
- 9.6.3: August 2024
- 9.6.4: Soon!



RHS Functions for Nav Domain

- `extrapolate-x-position`
- `extrapolate-y-position`
- `select-point-closest-to-vector`
- `haversine`





SVS

- SVS scene names are now case sensitive

- svcs s1.scene.world 

- svcs S1.scene.world 

- Consistent with the rest of Soar



LTI Aliases

- **Assignment:** `smem --add { (@test1 ^name test1 ^info @info1) (@info1 ^number 1) }`
- **Referenceable in other commands:**
 - `smem --query`
 - `smem --remove`
 - `smem --history`
 - `smem --export`
 - `visualize smem`
 - `print`



Bug Fixes

- `cd` command
- Production printing edge cases
- Don't ignore duplicate justifications



VisualSoar

- Features/ergonomics
- Bug fixes
- Improved stability
- Improved data integrity
- Increase modularity



VisualSoar – Undo Stack

```
anchor-relati
File Edit Search Soar Insert Template Runtime
sp {thor-soar*propose*anchor-relation-category
  (state <s> ^name thor-soar|
    ^world <world>)
  I<world> ^{ << in on >> <in-on> } <anchored-relation> <unanchored-rel
    ^objects.object <anchor-arg1-object>
      <anchor-arg2-object>
      <unanchor-arg1-object>
      <unanchor-arg2-object>)
  (<anchored-relation> ^argument1 <anchor-arg1-object>
    ^argument2 <anchor-arg2-object>)
  (<unanchored-relation> ^argument1 <anchor-arg1-object>
    ^argument2 <anchor-arg2-object>)
  (<anchor-arg1-object> ^object-handle <anchor-arg1-object-handle>
    ^category <category-arg1>
    ^anchored true)
  (<anchor-arg2-object> ^object-handle <anchor-arg2-object-handle>
    ^category <category-arg2>
    ^anchored true)
```



Search

```
anchor-relation-category
File Edit Search Soar Insert Template Runtime
sp {thor-soar*propose*anchor-relation-category
  (state <s> ^name thor-soar
    ^world <world>)
  (<world> ^{ << in on >> <in-on>} <anchored-relation> <unanchored
    ^objects.object <anchor-arg1-object>
      <anchor-arg2-object>
      <unanchor-arg1-object>
      <unanchor-arg2-object>)
  (<anchored-relation> ^argument1 <anchor-arg1-object>
    ^argument2 <anchor-arg2-object>)
  (<unanchored-relation> ^argument1 <anchor-arg1-object>
    ^argument2 <anchor-arg2-object>)
  (<anchor-arg1-object> ^object-handle <anchor-arg1-object-handle>
    ^category <category-arg1>
    ^anchored true)
  (<anchor-arg2-object> ^object-handle <anchor-arg2-object-handle>
    ^category <category-arg2>
    ^anchored true)
  (<unanchor-arg1-object> ^object-handle <unanchor-arg1-object-han
    ^category <category-arg1>
    ^anchored false)
  (<unanchor-arg2-object> ^object-handle <unanchor-arg2-object-han
    ^category <category-arg2>
    ^anchored false)
  ->
  (<s> ^operator <op> + =, >)
  (<op> ^name anchor-relation-category
    ^task-operator false
    ^argument1 <anchor-arg1-object-handle>
    ^argument2 <unanchor-arg1-object-handle>
    ^argument3 <anchor-arg2-object-handle>
    ^argument4 <unanchor-arg2-object-handle>)
}
```



Search

thor-soar

File Edit Search Datamap View Soar Runtime Help

thor-soar

- _firstload
- all
- elaborations
- _flags
- _readme
- _smem-object-adds
- _trace
- chunks
- external-operator-application
- Impasse_Operator_Conflict
- Impasse_Operator_Tie
- Impasse_State_No-Change
- anchor-info-existing-object
- anchor-object-category
- anchor-relation-category
- break-object
- clean-object
- clear-achieved-desireds
- close-container
- cook-microwave
- create-object-state-desired
- detect-illegal-desired

Datamap thor-soar

Search Edit Validation

thor-soar

- attends
- attribute: [operator state]
- choices: [multiple none]
- constants
- copy-destination
- copy-name : string
- depth: integer
- desireds
- epmem
- events
- failure
- flags
- impasse: [no-change]
- interaction-stack
- internal-actions: [false true]
- io
- name: [cook evaluate-operator put-i
- numeric-value: integer

anchor-object-category

File Edit Search Soar Insert Tem

```
sp {thor-soar*propose*anchor-object-c
  (state <s> ^name thor-soar
    ^world <world>)
  (<world> ^objects.object <anchor-a
    <unanchor
  (<anchor-arg1-object> ^object-hand
    <anchor-arg1-object-handle>
    ^category <c
    ^anchored tr
  (<unanchor-arg1-object> ^object-ha
    <unanchor-arg1-object-handle>
    ^category
    ^anchored
  ->
  (<s> ^operator <op> + =, >)
  (<op> ^name anchor-object-category
    ^task-operator false
    ^argument1 <anchor-arg1-obje
    ^argumet2 <unanchor-arg1-obj
  }

sp {apply*anchor-object-category*reje
  (state <s> ^operator <op>
```

Line: 10 Modified

Feedback (1)

thor-soar*propose*anchor-object-category: anchor-object-category(17): could not match constraint (<op>,argumet2,<unanchor-arg1-object-handle

Font size decreased to 12



Selection

```
anchor-object-category
File Edit Search Soar Insert Template Runtime
sp {thor-soar*propose*anchor-object-category
  (state <s> ^name thor-soar
    ^world <world>)
  (<world> ^objects.object <anchor-arg1-object>
    <unanchor-arg1-object>)
  (<anchor-arg1-object> ^object-handle <anchor-arg1-object-handle>
    ^category <category-arg1>
    ^anchored true)
  (<unanchor-arg1-object> ^object-handle <unanchor-arg1-object-handle>
    ^category <category-arg1>
    ^anchored false)
  ->
  (<s> ^operator <op> + =, >)
  (<op> ^name anchor-object-category
    ^task-operator false
    ^argument1 <anchor-arg1-object-handle>
    ^argument2 <unanchor-arg1-object-handle>)
}

sp {apply*anchor-object-category*reject-unanchored-objects
  (state <s> ^operator <op>
    ^world.objects <objects>)
  (<objects> ^object <object1> <object2>)
  (<op> ^name anchor-object-category
    ^argument2 <unanchor-arg1-object-handle>)
  (<object1> ^object-handle <unanchor-arg1-object-handle>)
  ->
  (<objects> ^object <object1> -)}

sp {apply*anchor-object-category*update-desired-holding-object
  (state <s> ^operator <op>
    ^desireds.desired.holding-object <h-object>)
  (<h-object> ^object-handle <unanchor-arg1-object-handle>)
  (<op> ^name anchor-object-category
    ^argument1 <anchor-arg1-object-handle>
    ^argument2 <unanchor-arg1-object-handle>)
  ->
  (<h-object> ^object-handle <anchor-arg1-object-handle>)
```



Selection

Preferences

Rule Editor General

Syntax Colors

☒ Enable Syntax Highlighting

"sp" "gp"

"-->" Literal Attributes

Variables Symbolic Constants

Rule editors must be reopened to realize changes

Current Selection Occurrence Highlighting

☒ Enable highlighting occurrences of current selection

Highlight Color



Save Actions

Preferences

Rule Editor General

Tiling

☒ Enable Auto-tiling

Default Tile Style: ☒ Horizontal ☐ Vertical

Save Actions

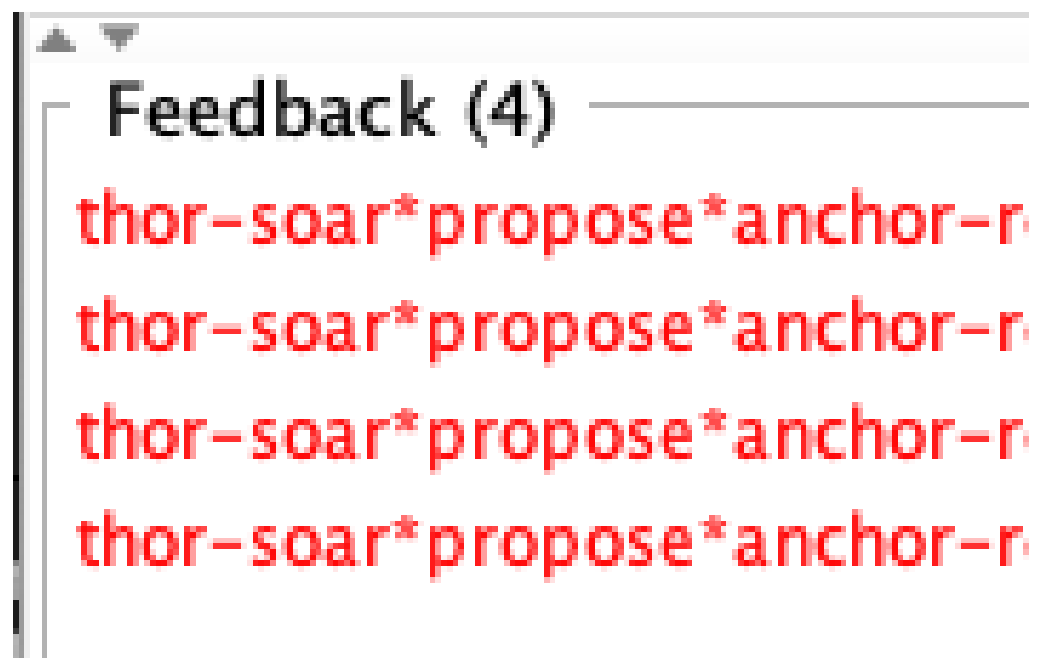
☒ Save project when datamap check passes

☒ Check project against datamap when saved

OK Cancel



VisualSoar – Feedback Window



```
Feedback (4)  
thor-soar*propose*anchor-r  
thor-soar*propose*anchor-r  
thor-soar*propose*anchor-r  
thor-soar*propose*anchor-r
```



VisualSoar - Shortcuts

- Fix broken ones
 - Undo/redo, find and more
- Use cmd key on Mac
- Ctrl/Cmd-A to select all
- ESC closes dialogs
- Ctrl/Cmd-, to open prefs
- Ctrl/Cmd-minus or equals to adjust font size





Font Size

thor-soar

File Edit Search Datamap View Soar Runtime Help

thor-soar

- _firstload
- all
- elaborations
- _flags
- _readme
- _smem-object-adds
- _trace
- chunks
- external-operator-applica
- Impasse__Operator_Conflic
- Impasse__Operator_Tie
- Impasse__State_No-Chang
- anchor-info-existing-objec
- anchor-object-category
- anchor-relation-category
- break-object
- clean-object
- clear-achieved-desireds
- close-container
- cook-microwave
- create-object-state-desire
- detect-illegal-desired
- dirty-object
- drive

Datamap_firstload

Search Edit Validation

- _firstload
 - attends
 - attribute: [operator state]
 - choices: [multiple none]
 - constants
 - copy-destination
 - copy-name : string
 - depth: integer
 - desireds
 - epmem
 - events
 - failure
 - flags
 - impasse: [no-change]
 - interaction-stack
 - internal-actions: [false true]
 - io
 - name: [cook evaluate-operator put-in sele
 - numeric-value: integer
 - operator : [exceed-depth more-in smem-
 - operator : [ground-desired-world-contex

anchor-object-category

File Edit Search Soar Insert Template

```
sp {thor-soar*propose*anchor-object-categ
(state <s> ^name thor-soar
    ^world <world>)
(<world> ^objects.object <anchor-arg1-
    <unanchor-arg
    (<anchor-arg1-object> ^object-handle
<anchor-arg1-object-handle>
    ^category <categ
    ^anchored true)
(<unanchor-arg1-object> ^object-handle
<unanchor-arg1-object-handle>
    ^category <cat
    ^anchored fals
-->
(<s> ^operator <op> + =, >)
(<op> ^name anchor-object-category
    ^task-operator false
    ^argument1 <anchor-arg1-object-h
    ^argument2 <unanchor-arg1-object
}

sp {apply*anchor-object-category*reject-u
(state <s> ^operator <op>
    ^world.objects <objects>)
(<objects> ^object <object1> <object2>
(<op> ^name anchor-object-category
```

Line:

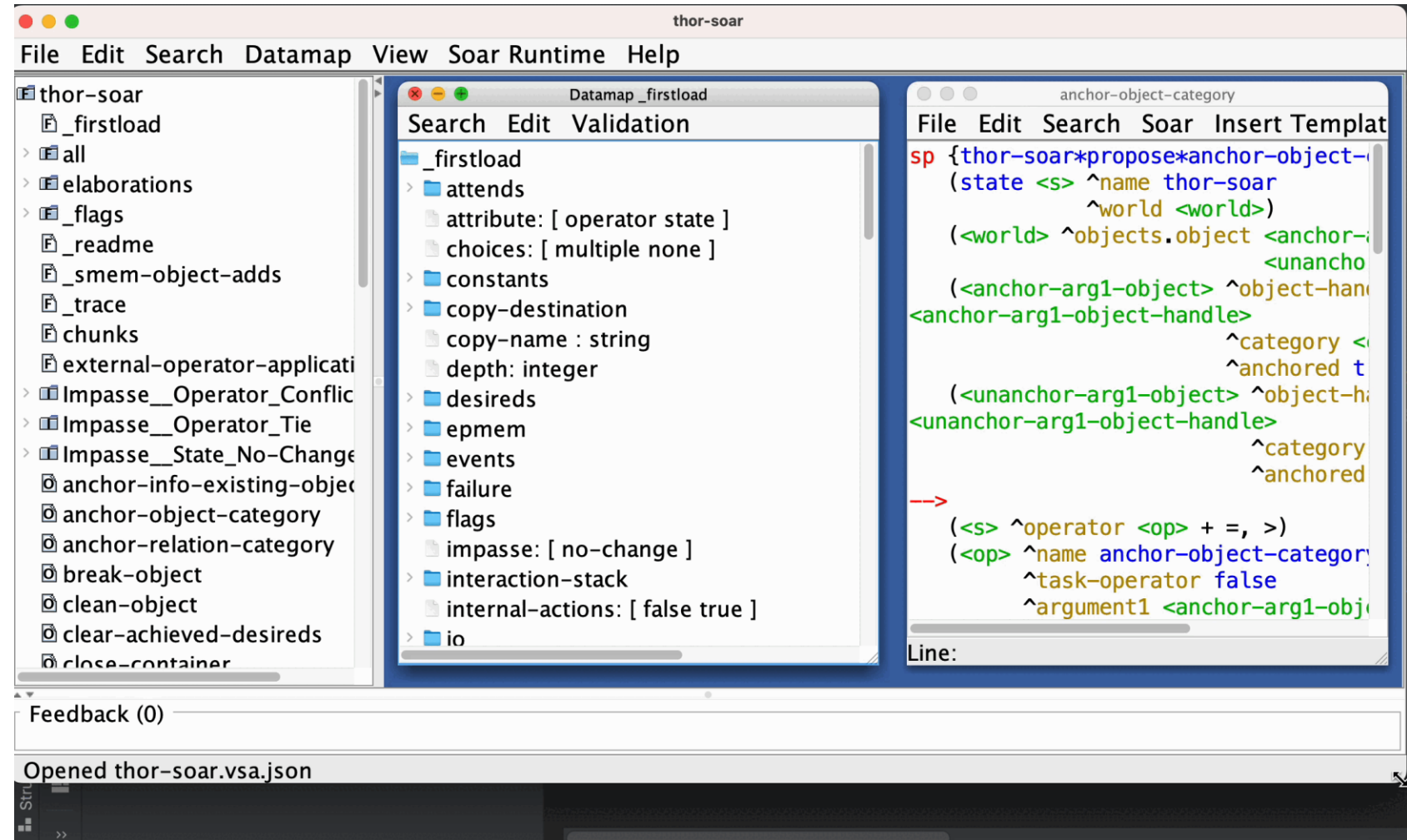
Feedback (1)

There were no errors detected in this project.

Font size decreased to 12



Responsive Resize



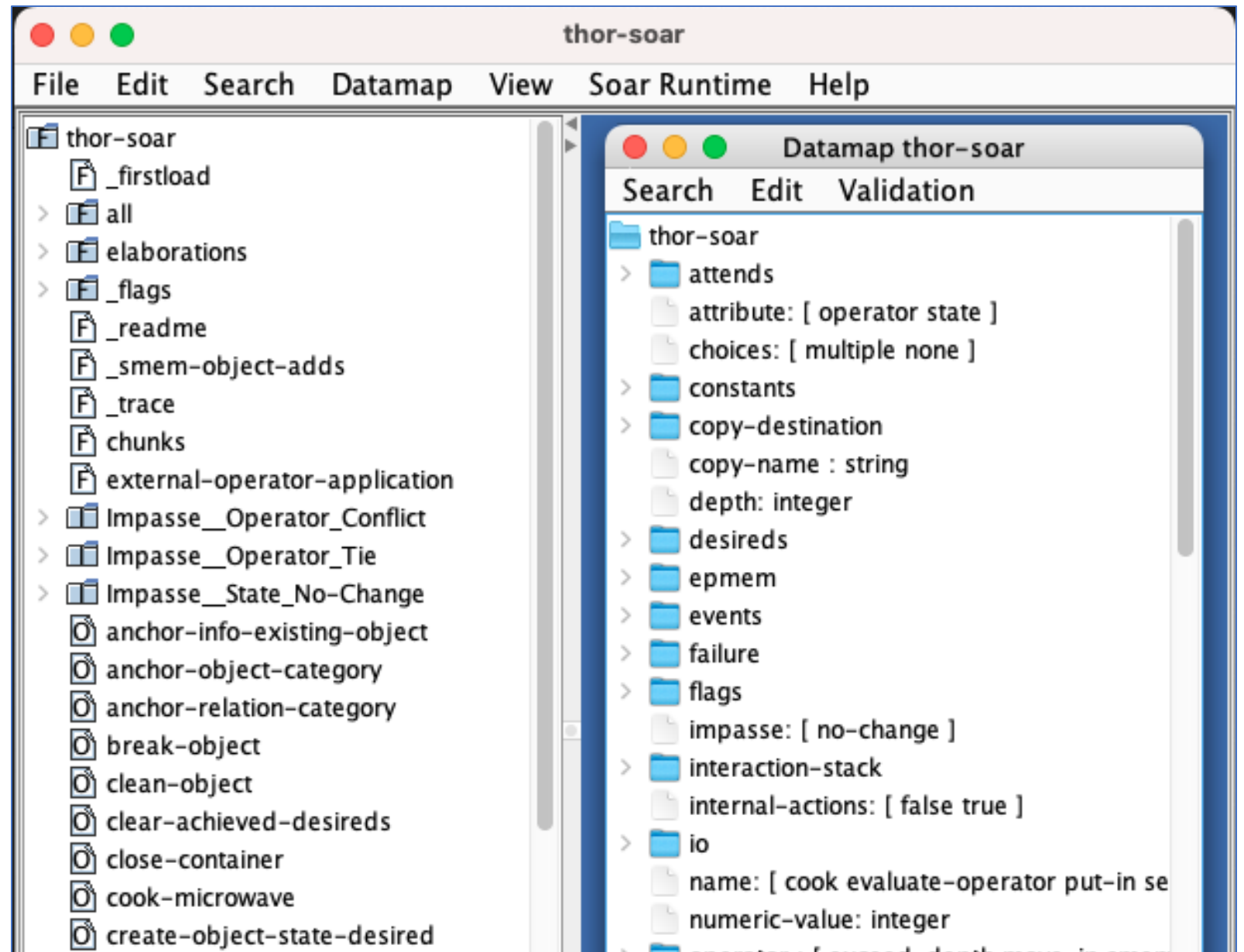


Visual Soar – Data Integrity

- Read/write project and config files atomically
- Fix cross-platform incompatibility issues in config files
- Improve error messages, fewer hidden from users
- Improve undo stack management
- Atomic compound edits
- Fix undo stack unexpectedly clearing
- Improve close/save action workflows to reduce surprises



Core Data Structures



Operator Hierarchy

Datamap



VisualSoar – Old Project Format

VERSION 4

\thor-soar\thor-soar.dm

0 ROOT thor-soar thor-soar 1

1 0 FOPERATOR _firstload _firstload.soar 2

2 0 FOLDER all all 3

3 2 OPERATOR failure failure.soar 4

4 2 OPERATOR wait wait.soar 5

5 0 FOLDER elaborations elaborations 6

...

...

0

0

0 + turn right, - turn left

0

0

584

SOAR_ID 0

ENUMERATION 1 1 init-thor-soar

INTEGER_RANGE 2 -2147483648 2147483647

FLOAT_RANGE 3 -Infinity Infinity

STRING 4

...

A project is made of 3 files:

- .vsa
- .dm
- comment.dm



VisualSoar – New Project Format

```
{  
  "version": "6",  
  "datamap": { /* ... */ },  
  "layout": { /* ... */ }  
}
```



VisualSoar – Datamap

```
{  
  "rootId": "XYZ",  
  "vertices": [  
    /*...*/  
  ]  
}
```



VisualSoar – Datamap Vertices

```
{  
  "id": "XYZ",  
  "outEdges": [  
    {  
      "name": "name",  
      "toId": "ABC"  
    }  
  ],  
  "type": "SOAR_ID"  
},
```

```
{  
  "choices": [  
    "false",  
    "true"  
  ],  
  "id": "123",  
  "type": "ENUMERATION"  
},
```




VisualSoar – Datamap Vertices

```
{  
  "id": "foo",  
  "max": 3,  
  "min": 0,  
  "type": "INTEGER"  
},
```

```
{  
  "id": "bar",  
  "max": 1.0,  
  "min": 0.0,  
  "type": "FLOAT"  
}
```



VisualSoar – Layout/Operator Hierarchy

```
{  
  "folder": "thor-soar",  
  "id": "ABC",  
  "name": "thor-soar",  
  "type": "OPERATOR_ROOT",  
  "children": [/*...*/]  
}
```



VisualSoar – Operator Hierarchy

```
{
  "dmId": "ABC",
  "file": "_flags.soar",
  "folder": "_flags",
  "id": "123",
  "name": "_flags",
  "type": "HIGH_LEVEL_FILE_OPERATOR",
  "children": [
    {
      "file": "_chunking-flags.soar",
      "id": "F00",
      "name": "_chunking-flags",
      "type": "FILE_OPERATOR"
    }
  ]
}
```



VisualSoar – New Project Format

```
{
  "datamap": {
    "rootId": "02f6629c87fa4ba2a084dbd2fbff3c3a",
    "vertices": [
      {
        "id": "02f6629c87fa4ba2a084dbd2fbff3c3a",
        "outEdges": [
          {
            "name": "attends",
            "toId": "32ac357a929743018c78bc9db054f514"
          },

```



VisualSoar – New Project Format

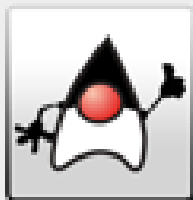
- Far less likely to be corrupted
- More human-readable (and repairable!)
- Easier to use with VSC (Git)
- More machine readable (tool developers welcome!)
- Handles arbitrary enum strings, attribute and operator names, etc.



Automatic Project Migration



Project Converted



Your project has been written in a new format in `thor-soar.vsa.json`. After ensuring you have a backup, you should manually remove the old `thor-soar.vsa`, `thor-soar.dm` and `comment.dm` files.

OK



VisualSoar - CLI

`--project <path> --check productionsAgainstDatamap`

```
✗ propose*initialize-has-datamap-errors: initialize-has-d  
atamap-errors(6): could not match constraint (<o>,name,wro  
ng-name) in production  
✗ Unable to check productions due to parse error  
✗ elaborations/top-state(10): parser.ParseException: Enco  
untered " <VARIABLE> "<op> "" at line 10, column 4.  
Was expecting:  
    "-->" ...
```



VisualSoar Modularity

- Open project format
- Project API
 - Validate Soar code against DM
 - Many more possibilities!
- Potential uses:
 - IDE integrations
 - CI workflows





VisualSoar





PTO Shaft





Enhance your workflow with extensions

Tools from the community and partners to simplify tasks and automate processes

soar datamap



Featured



Copilot



Models



Apps



Actions



+ Create a new extension

Search results for "soar datamap"

1 result

Filter: All



By: All creators



Sort: Popularity



Soar Datamap...

Action

Validate Soar project code against its datamap using VisualSoar



Example Usage

```
name: Validate Soar Project

on:
  push:
    paths:
      - "path/to/soar/project/**"

jobs:
  validate:
    runs-on: ubuntu-latest
    steps:
      - name: Checkout Repository
        uses: actions/checkout@v3

      - name: Run VisualSoar Validation
        uses: SoarGroup/check_soar_datamap_action@v1.0.4
        with:
          projectPath: "path/to/soar/project/thor-soar.vsa.json"
```





Annotations

9 errors and 2 warnings

- ✖ **Build and Test (macos-latest):** agent/thor-soar/clear-achieved-desireds.soar#L23
"Operator node diagnostic" – "parser.ParseException: Encountered \" <VARIABLE>
[Show more](#)
- ✖ **Build and Test (macos-latest)**
"Unable to check productions due to parse error"
- ✖ **Build and Test (macos-latest):** agent/thor-soar/anchor-relation-category.soar#L17
"Operator node diagnostic" – "could not match constraint (<anchor-arg2-object>,
[Show more](#)







VisualSoar - Build/Infrastructure

- Automated building and testing with GitHub Actions
- Unit testing with Junit
- Standalone builds with Jpackage
- Updated to Java 11

All checks have passed ×

4 successful checks

| | | |
|---|--|-------------------------|
| ✓ |  Build and Test / build (windows-latest) (push) Successful in 5m | Details |
| ✓ |  Build and Test / build (ubuntu-latest) (push) Successful in 2m | Details |
| ✓ |  Build and Test / build (macos-15) (push) Successful in 1m | Details |
| ✓ |  Build and Test / build (macos-latest) (push) Successful in 1m | Details |



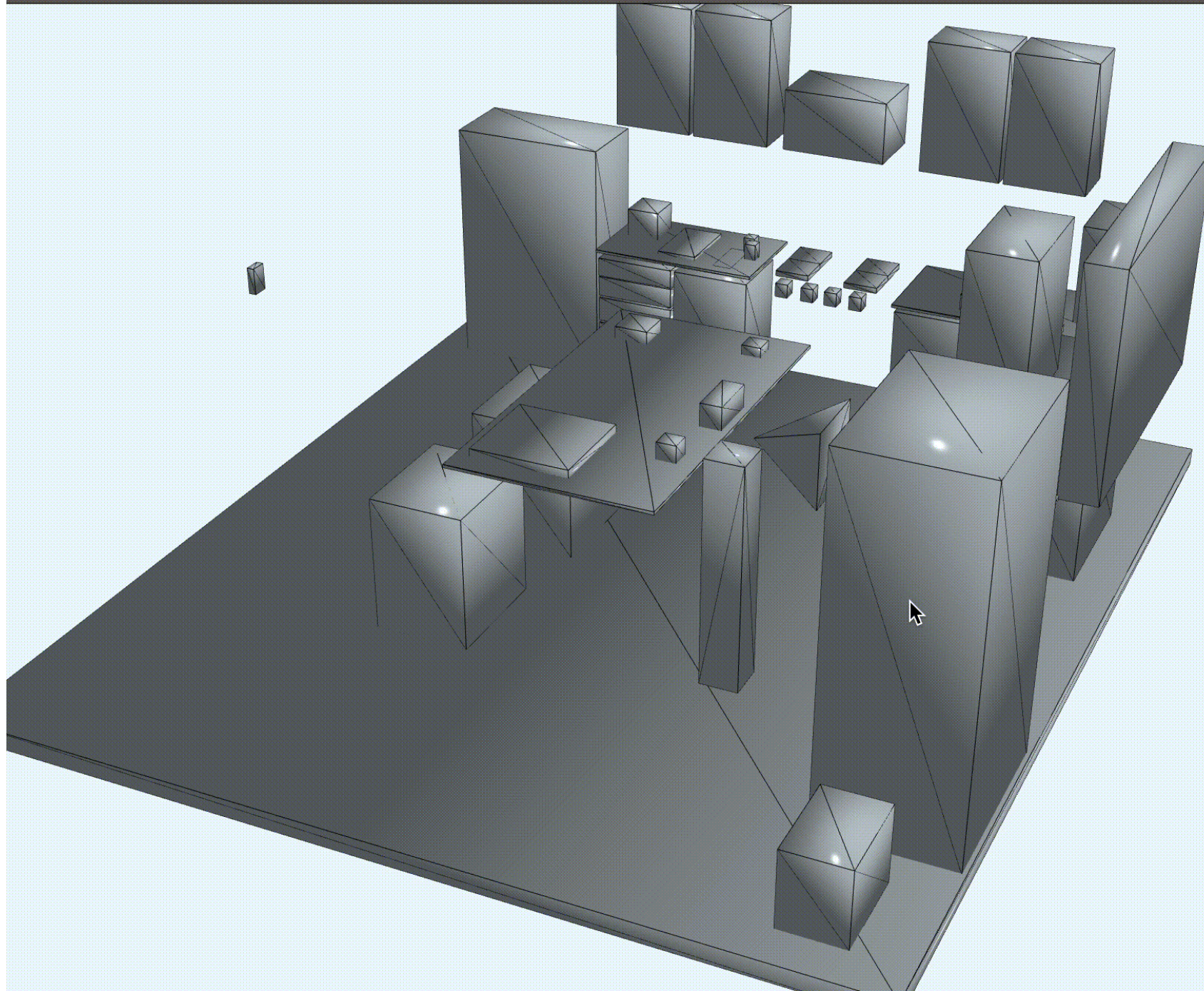
Debugger

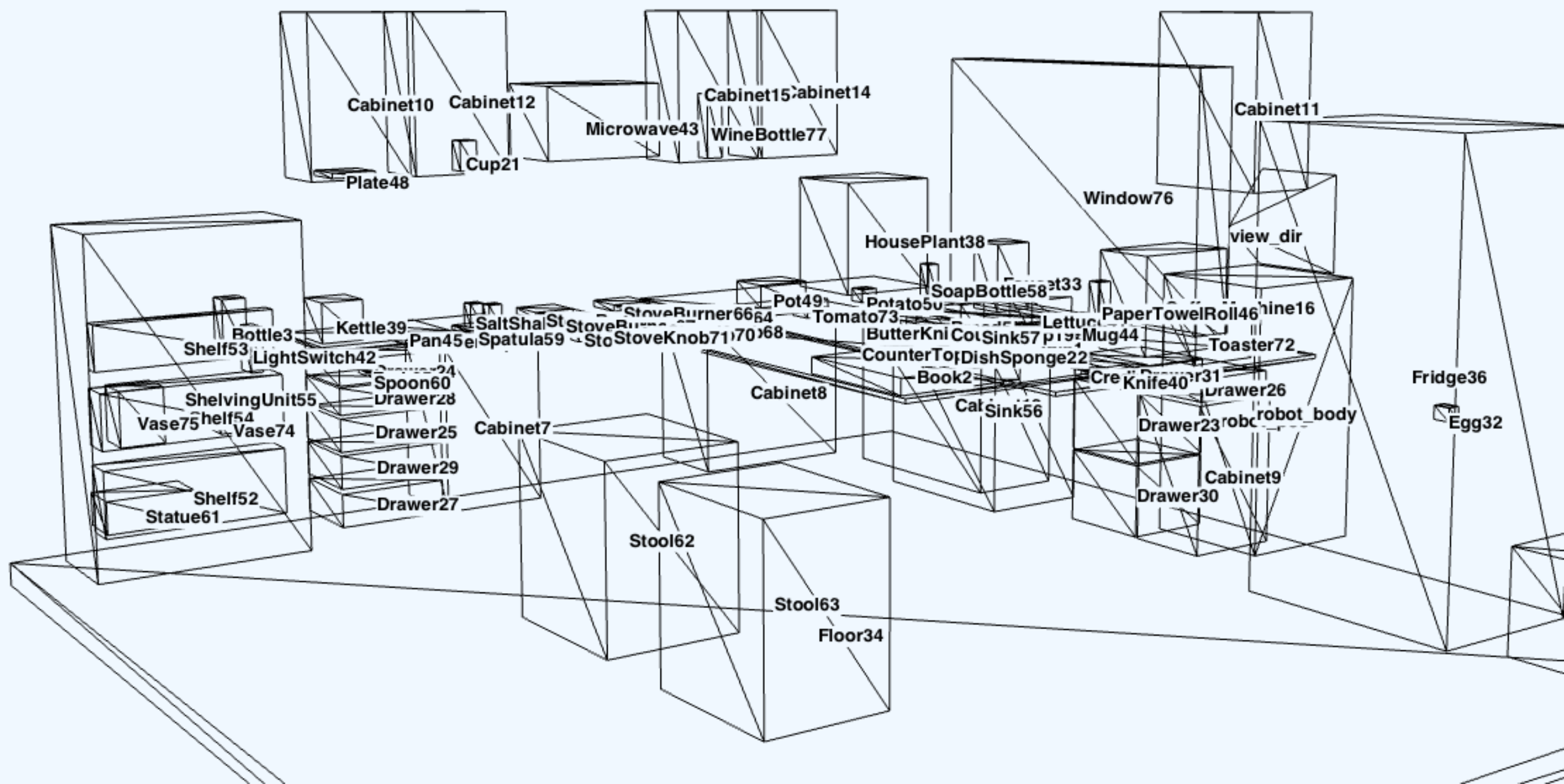
- Stability
- Copy/paste behavior
- Right-click targets
- CLI cleanup
- “Select all” shortcut

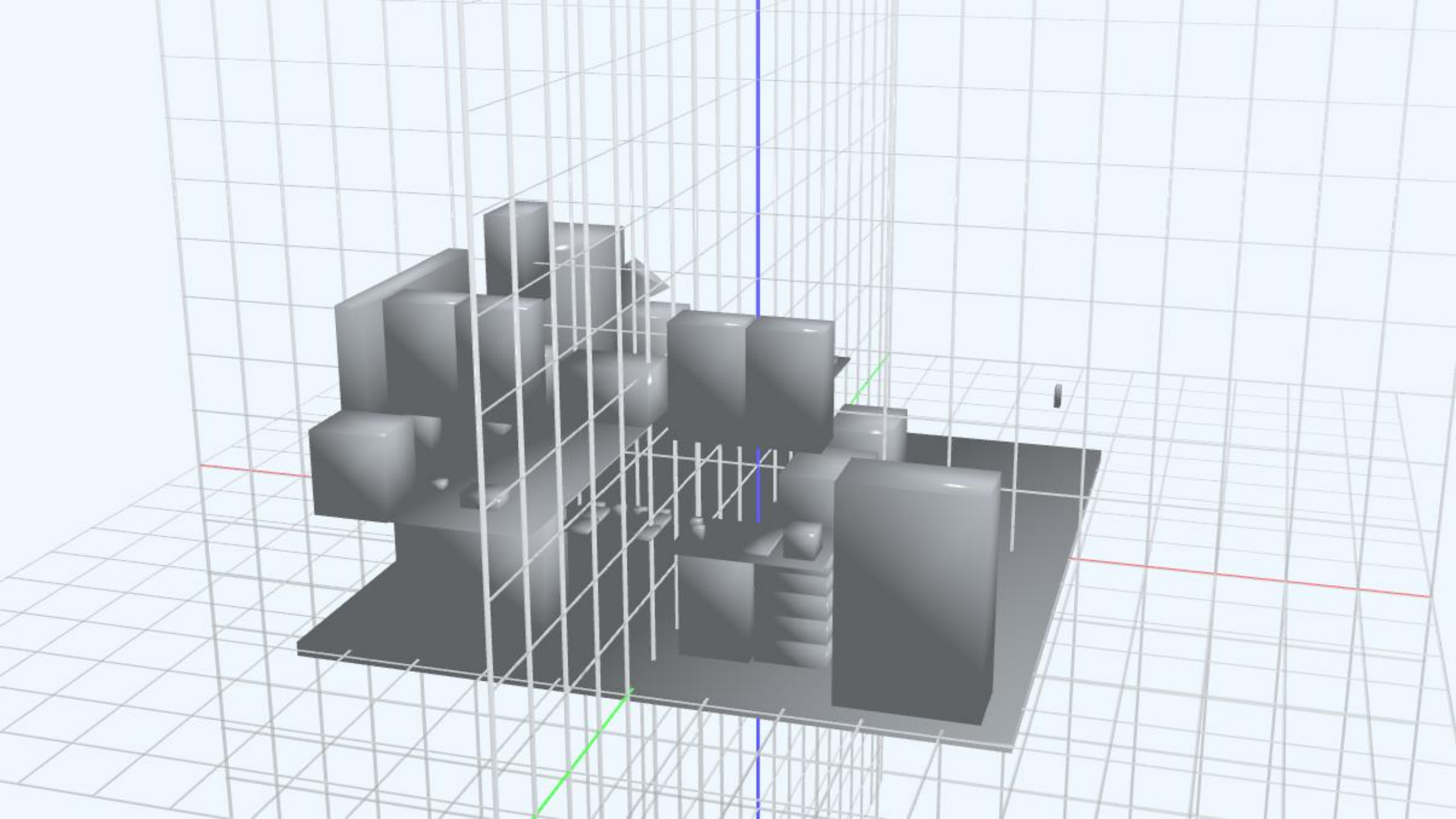
The screenshot shows the Soar Debugger in Java interface with the title bar "Soar Debugger in Java - remote thor-soar". The main window displays a list of objects in a dark-themed text editor. The objects are listed with their attributes and values, such as temperature, category, grabbed status, in-view status, mass, material, and object-handle. A context menu is open over the list, showing options like "print A1", "print --depth 2 A1", "print --internal A1", "print (* ^* A1)", "preferences A1", "preferences A1 --object", and "Window". The menu is styled with a blue header bar and a right-pointing arrow at the bottom.

```
^temperature room-temp)
(08 ^category cabinet ^in-view false ^object-handle Cabinet7
^temperature room-temp)
(07 ^category butterknife ^grabbed false ^in-view false ^mas
^material metal ^object-handle ButterKnife6 ^temperat
(06 ^category bread ^grabbed false ^in-view false ^mass 0.70
^material food ^object-handle Bread5 ^sliced false
^temperature room-temp)
(05 ^broken false ^category bowl ^dirty false ^fill-amount e
^grabbed false ^in-view false ^mass 0.470000 ^materia
^object-handle Bowl4 ^temperature room-temp)
(04 ^broken false ^category bottle ^fill-amount empty ^grabb
^in-view false ^mass 0.200000 ^material glass
^object-handle Bottle3 ^temperature room-temp)
(03 ^category book ^grabbed false ^in-view false ^mass 0.500
^material paper ^object-handle Book2 ^open false
^temperature room-temp)
(078 ^broken false ^category winebottle ^fill-amount full ^g
^in-view false ^liquid-contents wine ^mass 1.200000 ^
^object-handle WineBottle77 ^temperature room-temp)
(I5 ^arm A1 ^pose P1)
(A1 ^hol
(P1 ^cam
(T1 ^ms 20
```

Waiting for connection at port 12122.
Connect from Soar with:
`svs connect_viewer 12122`









Java SVS Viewer

- Only shows scene for S1
- [Repo: https://github.com/garfieldnate/JavaSVSViewer](https://github.com/garfieldnate/JavaSVSViewer)
- Package downloads available

Releases 3



Fix geometry correctness issue

Latest

on Aug 7, 2024

+ 2 releases



Thank you to Soar contributors!

- Moritz Schmidt
- Johnathan de Jong
- James Boggs
- Bob Marinier
- Bryan Stearns
- Christopher Barber
- And more! Sorry for not mentioning you! You are appreciated!
- Would love more contributions to core Soar, documentation, website, issue discussions, tutorials, etc.



The Future

- Ergonomics and beginner-friendliness
- Enabling collaborative agent development
- Productivity tools
- Stability
- Simpler/faster build and distribution
- Documentation



Nuggets and Coal



- Many Soar and Soar tool goodies this year
- VisualSoar developer accessibility
- Bug fixes



- Release process still complex
- Need to level up core Soar dev tools
 - Chunking
 - Fuzz testing
 - Sanitizers



Thank you!

Questions and comments are welcome

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<https://github.com/SoarGroup/Soar/issues>