SVS Discussion

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2016 Soar Workshop

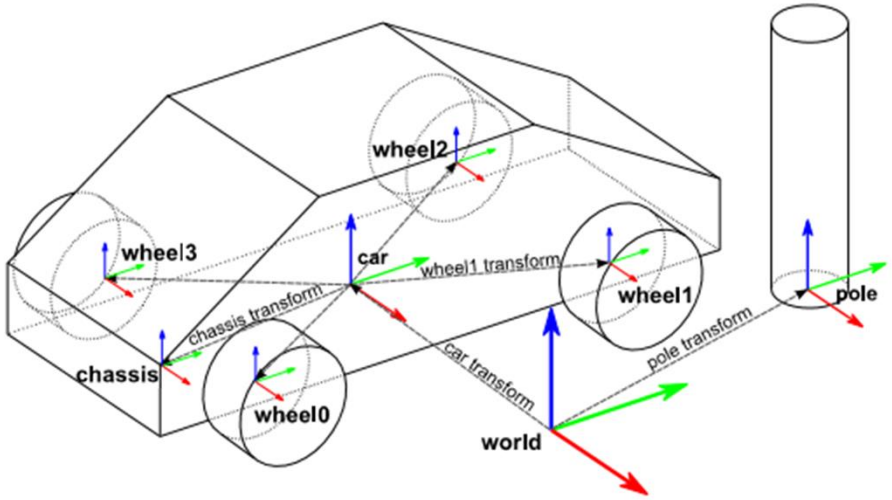
Major Aspects of SVS

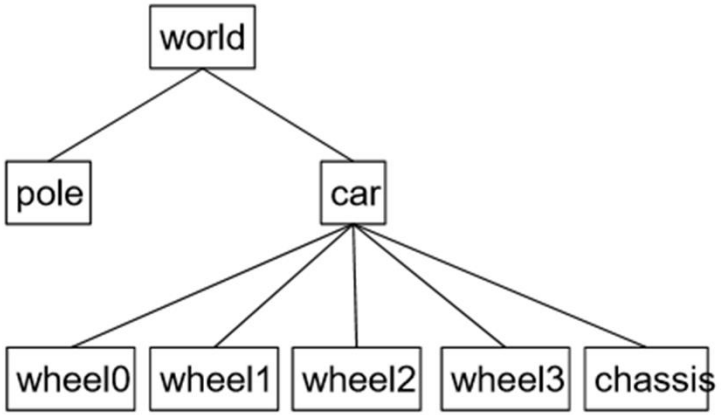
- Specific Scene Representation
- Flexible Soar Interface

Scene Graph Representation

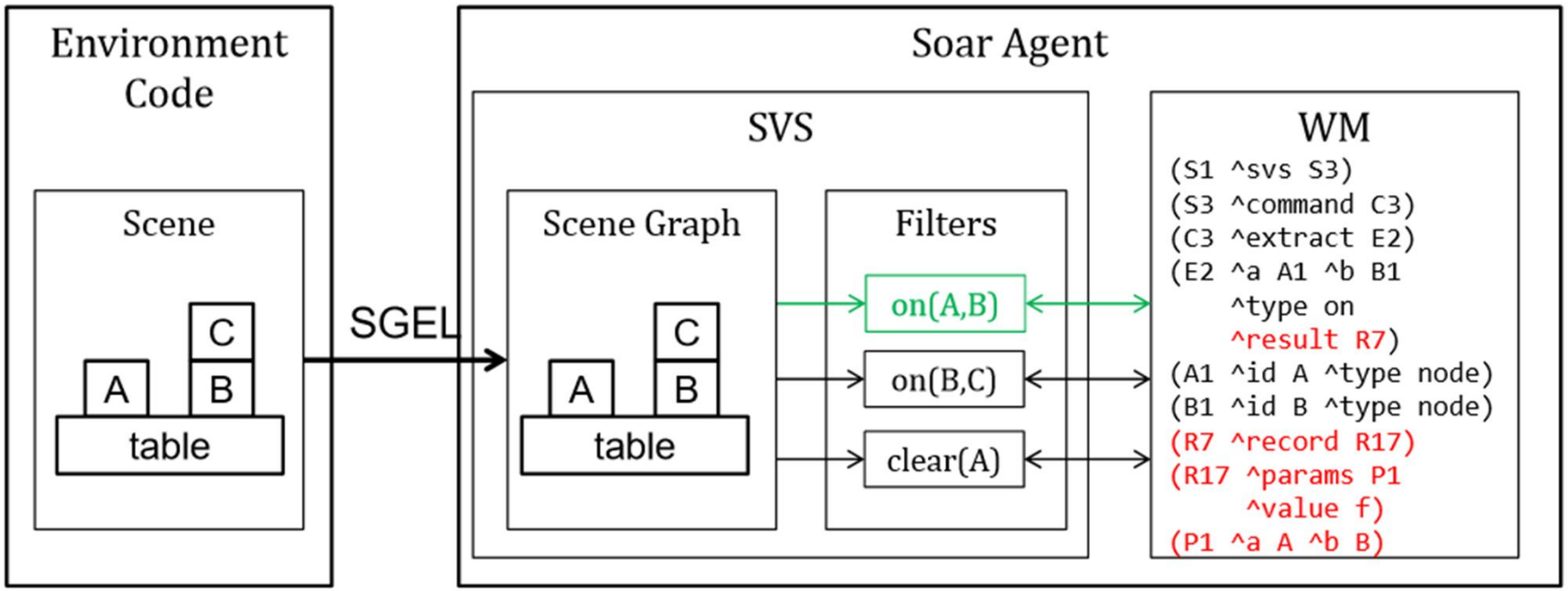
- Organizes objects as tree of nodes
- Child nodes are a part of the parent node
  - Group nodes
  - Geometry nodes
- Each node as position, rotation, transform
- Copied to each substate

```
(S1 ^svs S3)
(S3 ^command C3 ^spatial-scene S4)
(S4 ^id world ^child C1 ^child C2)
(C1 ^id pole)
(C2 ^id car ^child C3 ^child C4
    ^child C5 ^child C6 ^child C7)
(C3 ^id wheel0)
(C4 ^id wheel1)
(C5 ^id wheel2)
(C6 ^id wheel3)
(C7 ^id chassis)
```





SVS Interface



Scene Graph Edit Language

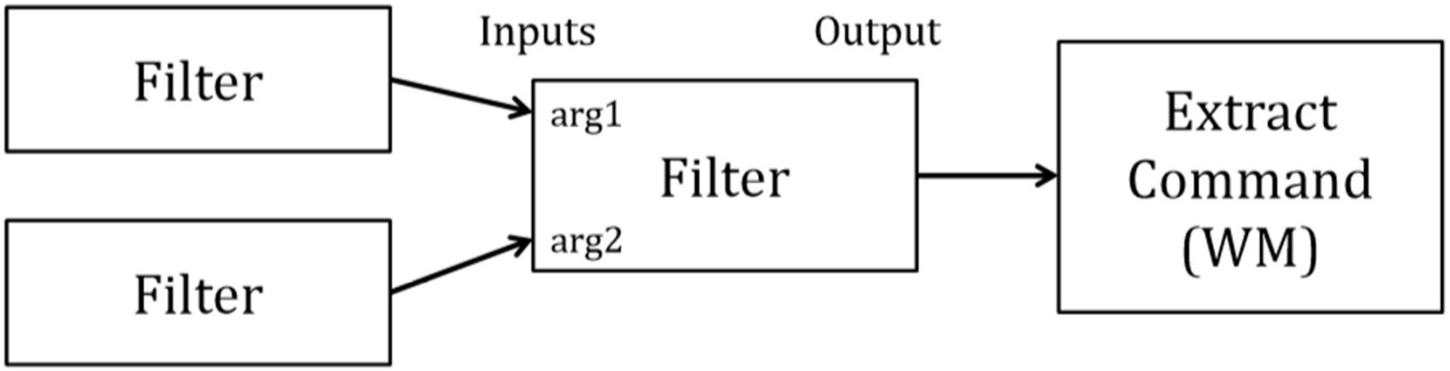
```
add <id> <parent> [GEOM] [TRANS]
change <id> [TRANS]
delete <id>
tag add|change|delete <id> <tag_name> <tag_val>

GEOMETRY:
      ball <rad>
      vertices x1 y1 z1 x2 y2 z2 ...
TRANSFORM
      pos x y z, rot x y z, scale x y z
```

Soar Commands

- add_node
- copy_node
- set_transform
- delete_node
- set_tag
- delete_tag

SVS Filters

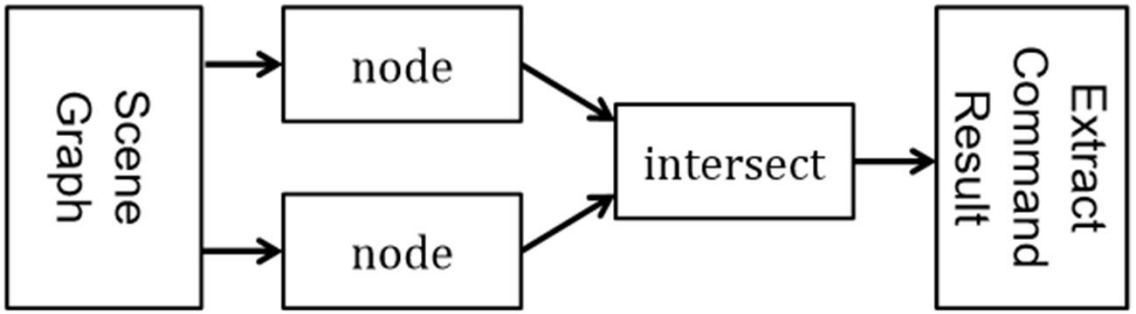
- Transform continuous information from scene graph into symbolic information in working memory
- Can combine filters into a pipeline
- Avoids recomputation when possible



Filter Example

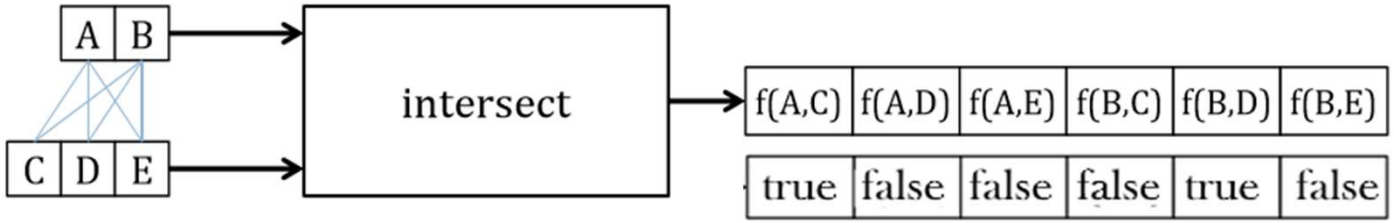
```
(S1 ^svs S3)
(S3 ^command C3 ^spatial-scene S4)
(C3 ^extract E2)
(E2 ^a A1 ^b B1 ^type intersect)
(A1 ^id b1 ^type node)
(B1 ^id b2 ^type node)
```

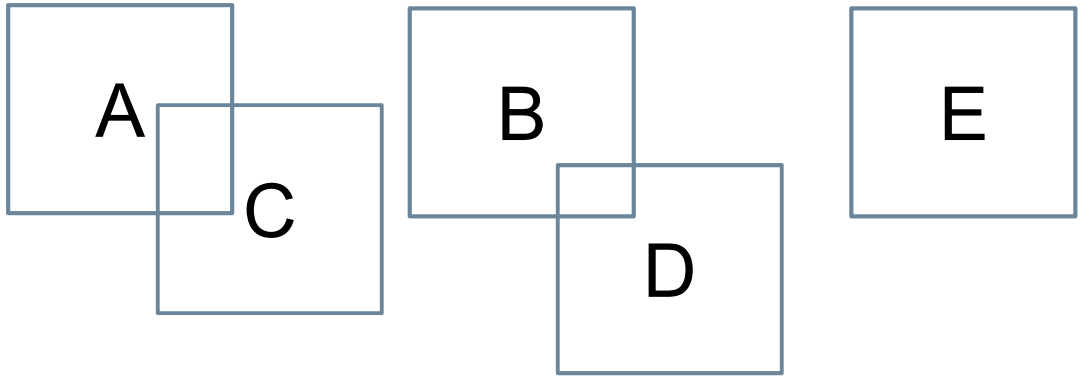
```
(S1 ^svs S3)
(S3 ^command C3 ^spatial-scene S4)
(C3 ^extract E2)
(E2 ^a A1 ^b B1 ^type intersect ^result R7
    ^status success)
(A1 ^id b1 ^type node ^status success)
(B1 ^id b2 ^type node ^status success)
(R7 ^record R17)
(R17 ^params P1 ^value f)
(P1 ^a b1 ^b b2)
```



Filter Combinations

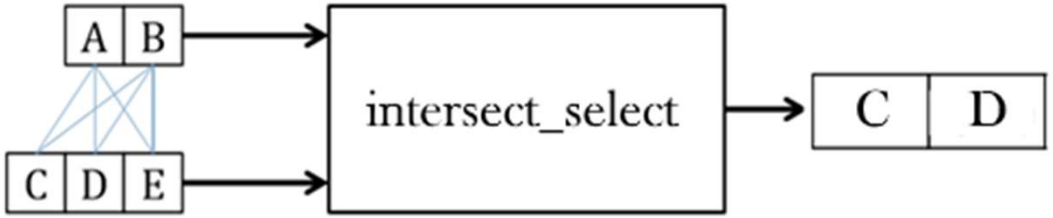
- Filters can handle multiple objects as inputs and outputs
  - map (Cartesian Product)

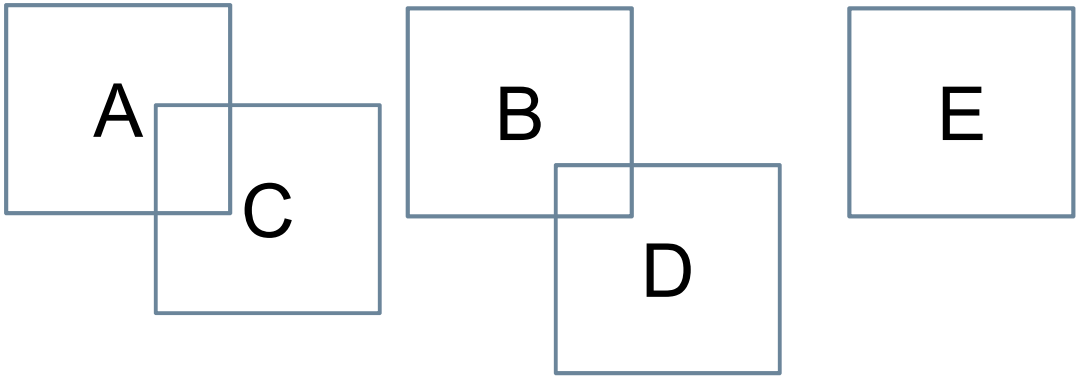




Filter Combinations

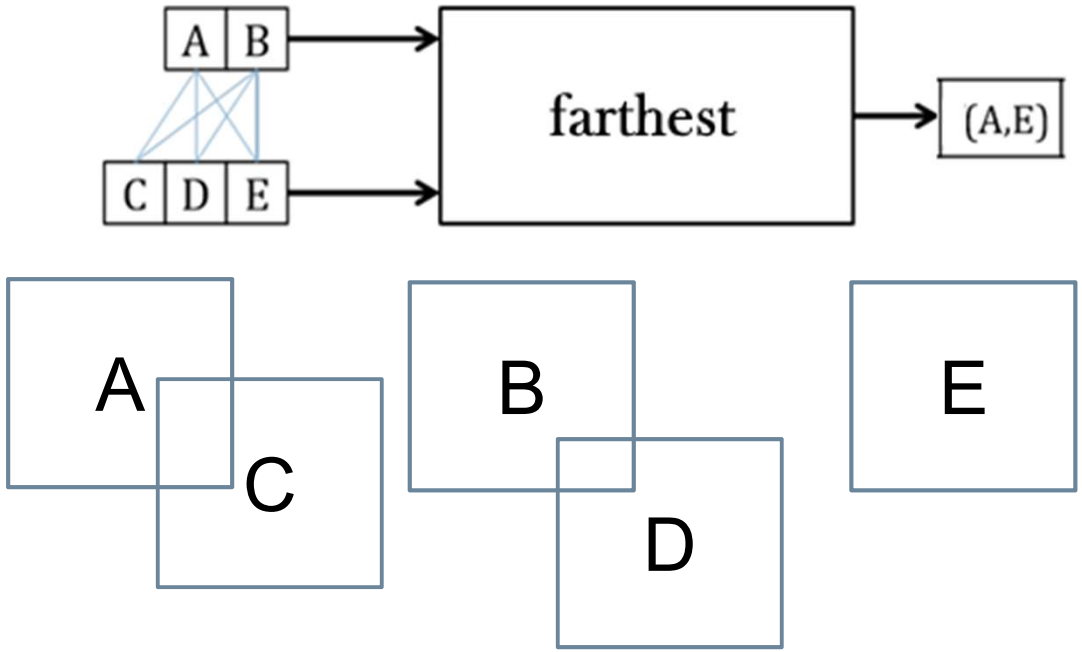
- Filters can handle multiple objects as inputs and outputs
  - select (subset)





Filter Combinations

- Filters can handle multiple objects as inputs and outputs
  - rank (greatest/least)

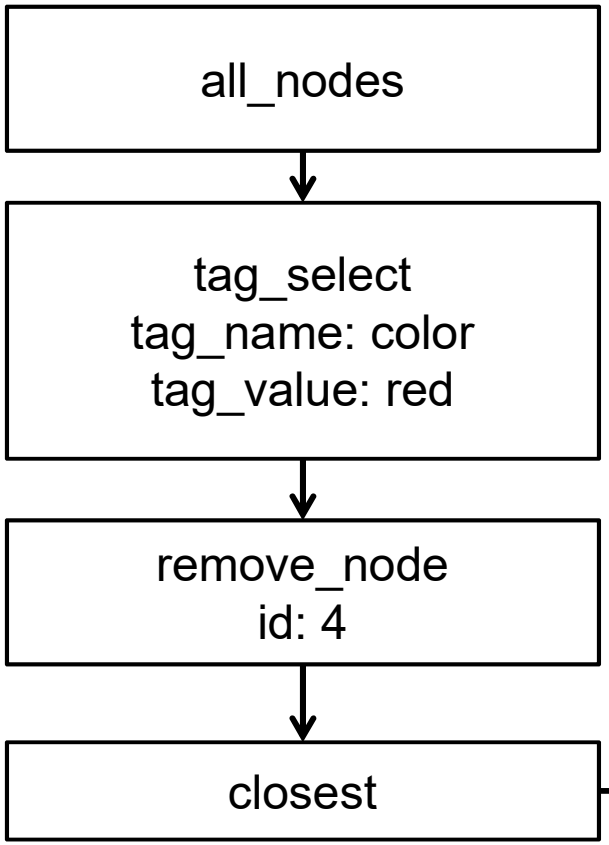


Current Filters

Filter	Parameters	Type	Output type
node	id	map	node
all_nodes	none	special	node
[xyz]-greater-than	a, b	map	boolean
[xyz]-less-than	a, b	map	boolean
[xyz]-aligned-than	a, b	map	boolean
on-top	a, b	map	boolean
intersect	a, b	map	boolean
distance	a, b	map	float
closest	a, b	rank	node
smaller-than	a, b	map	boolean

SVS Examples

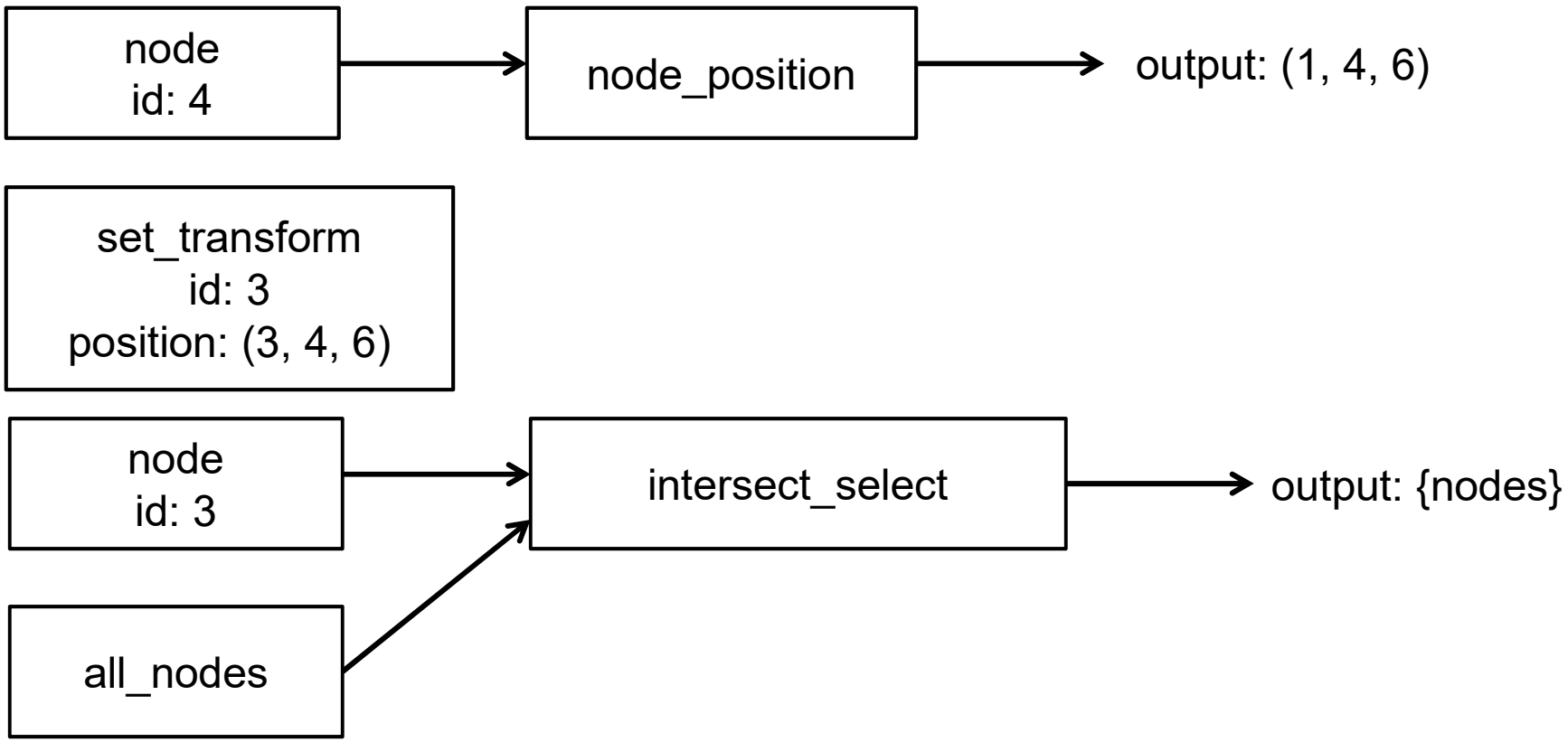
- Other than object 4, what is the closest red object?




```
(state <s> ^svs.command <cmd>)
(<cmd> ^extract <e>)
  (<e> ^type closest
       ^a <rem>)
    (<rem> ^type remove_node
           ^id 4
           ^a <tsel>)
       (<tsel> ^type tag_select
               ^tag_name color
               ^tag_value red
               ^a <all>)
           (<all> ^type all_nodes)
```

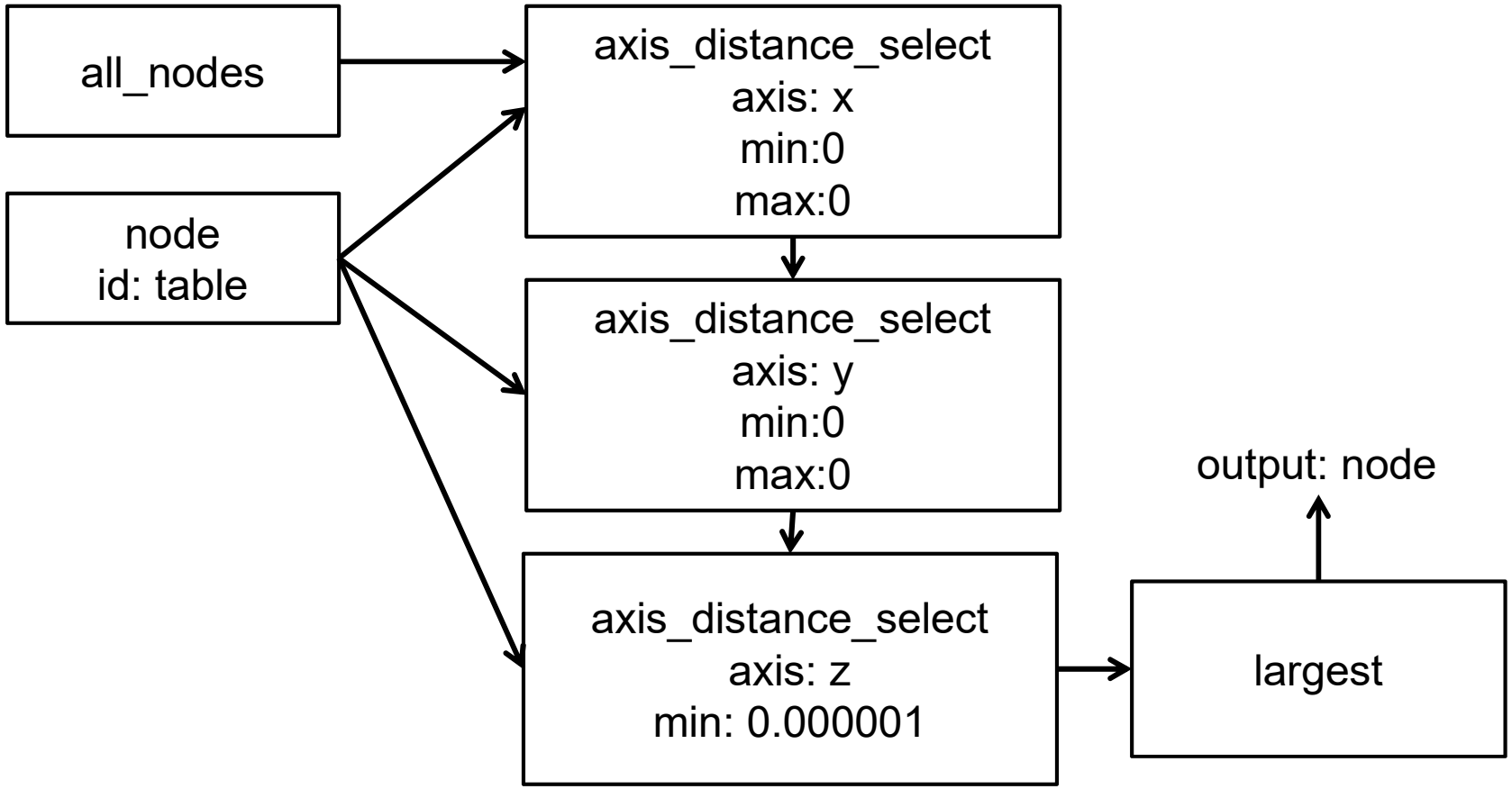
SVS Examples

If I put object 3 right of object 4, will it intersect anything?



SVS Examples

Find the largest object on the table



Questions?

Discussion