Mental mapping

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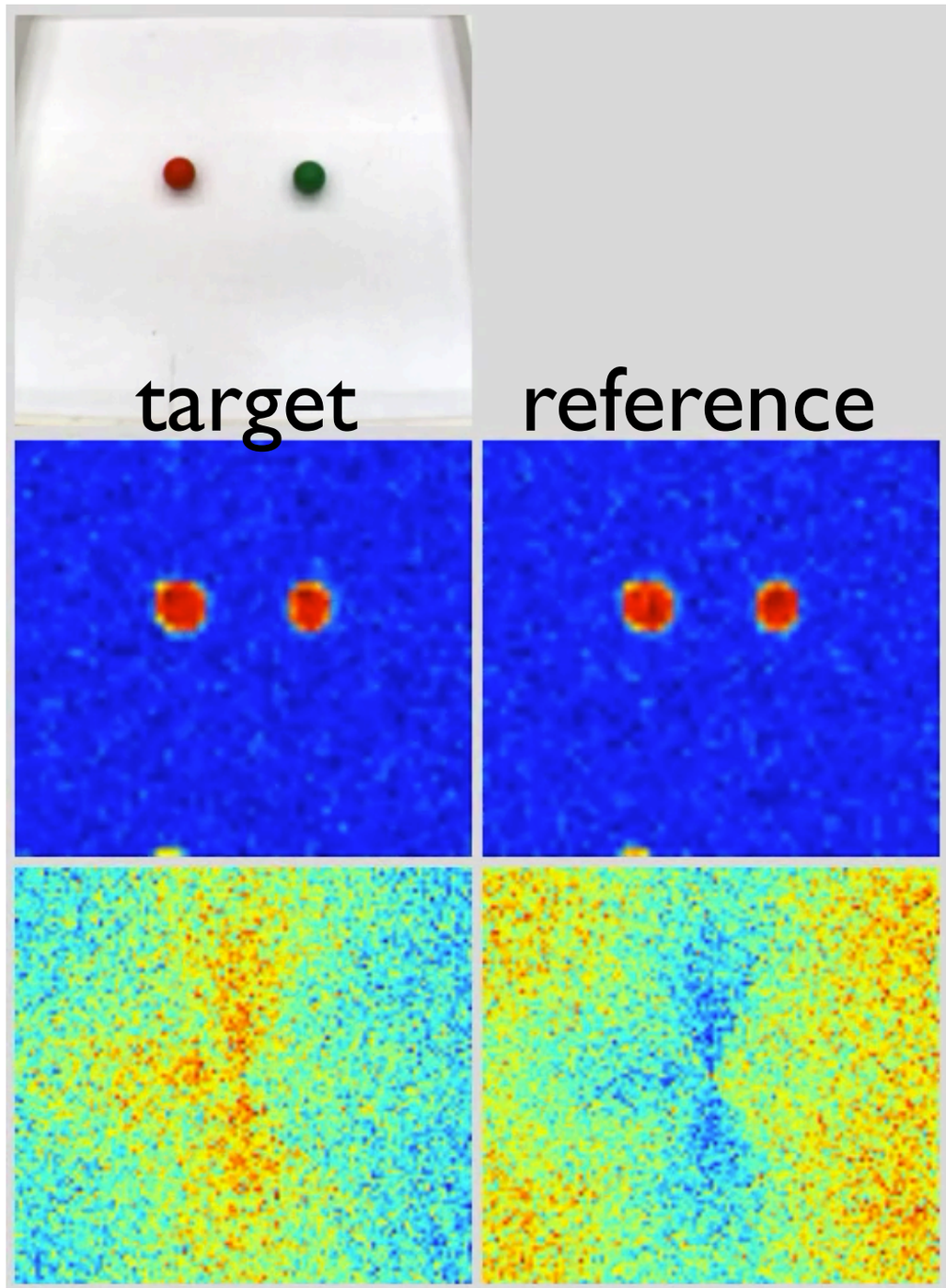
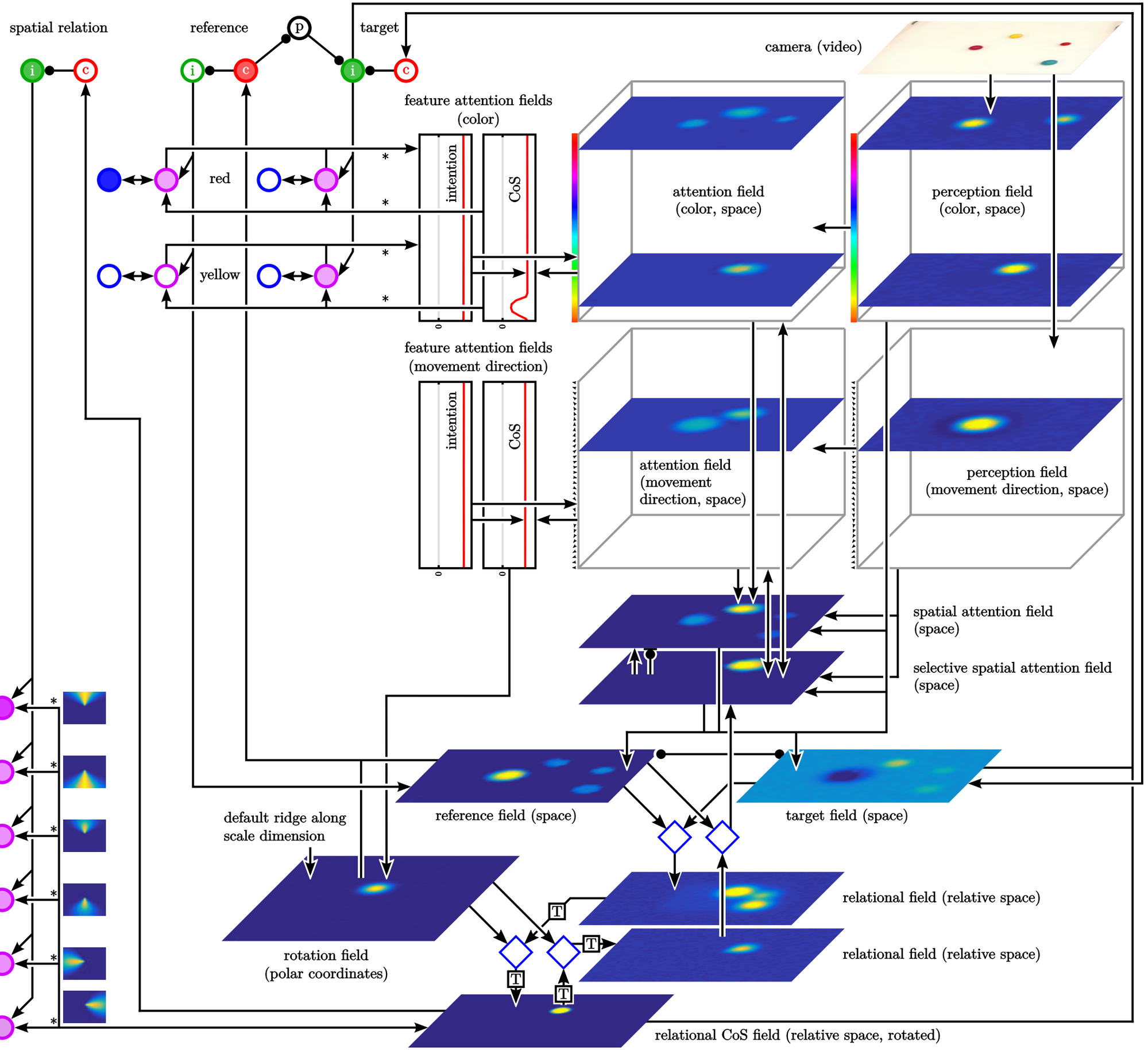
Recall from last lecture: Concepts, relational thinking

- Talking about objects entails bringing the targeted object into the attentional foreground

[Lipinski, Sandamirskaya, Schöner 2009 … Richter, Lins, Schöner, *Topics* 2017]

"red to the left of green"





[Richter, Lins, Schöner, ToPiC (2017)]

role filler binding

spatial relation

reference

target

i

c

p

camera (video)

red

yellow

*

intention

CoS

0

(movement direction)

attention field
(movement
direction, space)

color
concepts

cued visual search

reference
p
target
i
c
i
c
red
yellow
*
*
*
*
f ture attention fields
(color)
intention
CoS
0
0
feature attention fields
(movement direction)
tention
CoS
0
0
camera (video)
attention field
(color, space)
perception field
(color, space)
attention field
(movement
direction, space)
perception field
(movement direction, spa
spatial attention field
(space)
selective spatial attention field
(space)

relational
neural
operators

toward

away

above

below

left

right

*

efault ridge along
cale dimension

rotation fiel
(polar coordina

yellow

*

*

feature attention fields
(movement direction)

intention

CoS

attention field
(movement
direction, space)

perception field
(movement direction, space)

coordinate
transform

spatial attention field
(space)

selective spatial attention field
(space)

default ridge along
scale dimension

reference field (space)

target field (space)

rotation field
(polar coordinates)

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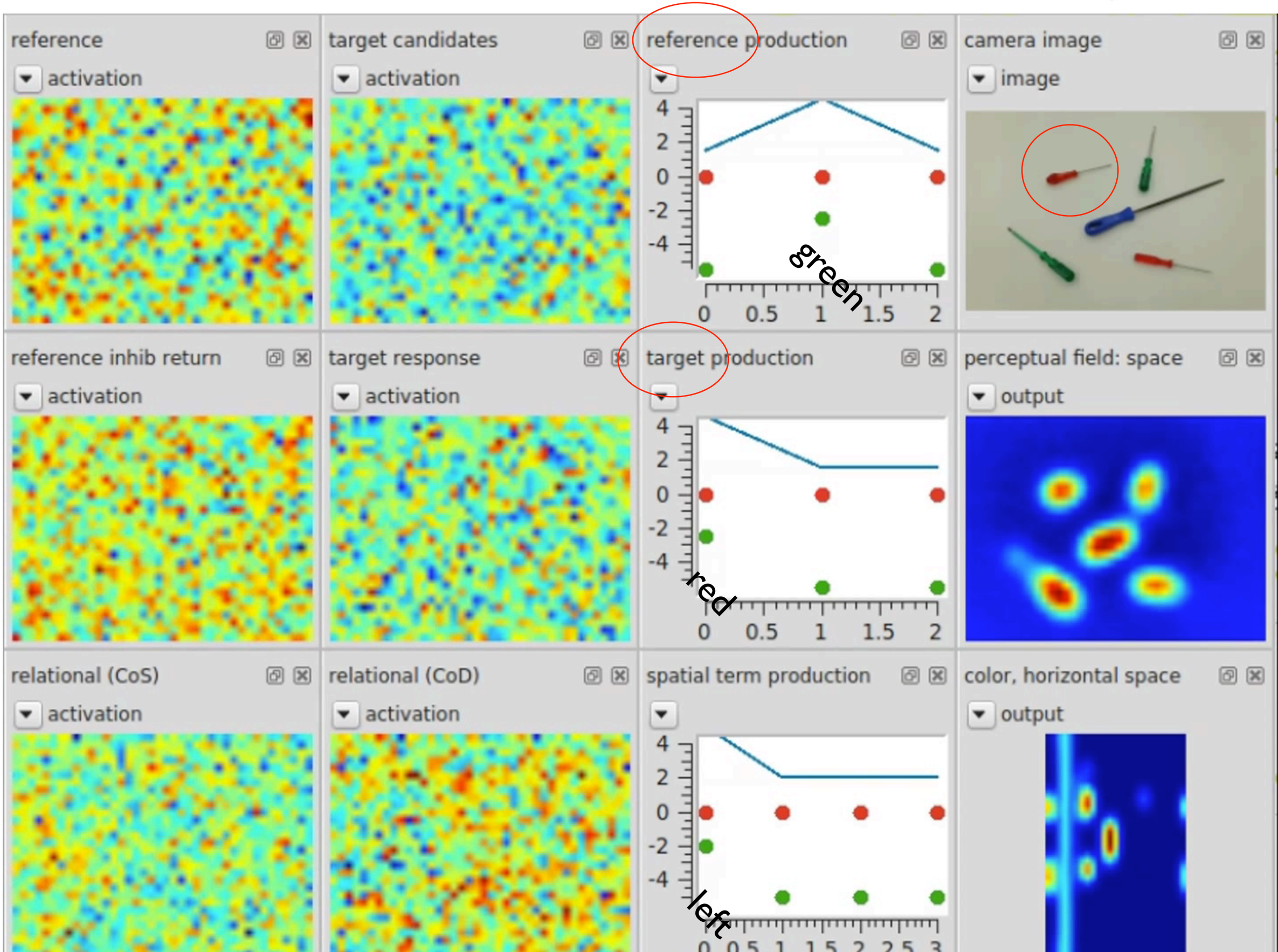
relational field (relative space)

relational field (relative space)

relational CoS field (relative space, rotation)

“red to the left of green”

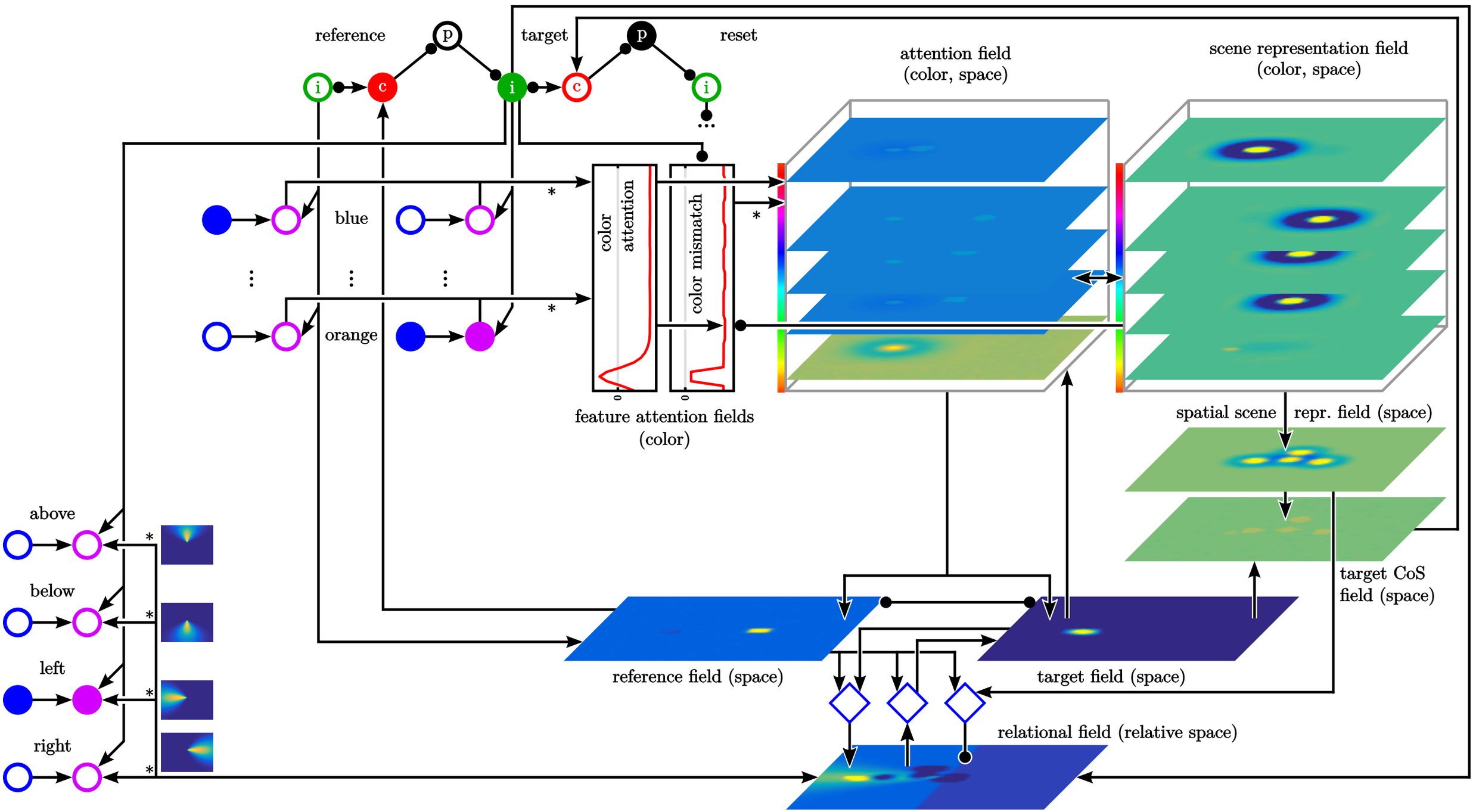


Mental mapping and inference

- making sense of propositions (about spatial relations) purely mentally, without any perception to ground in
- and operating on such “sense” by drawing inferences…

Mental mapping and inference

- mental map formation from propositions
  - “There is a cyan object above a green object.”
  - “There is a red object to the left of the green object.”
  - “There is a blue object to the right of the red object.”
  - “There is an orange object to the left of the blue object.”
- inference
  - “Where is the blue object relative to the red object?”



[Kounatidou, Richter, Schöner, CogSci 2018]

p

reset

i

attention field
(color, space)

scene representation field
(color, space)

color

attention

color mismatch

*

0

0

ture attention fields
(color)

instance creation
from boost driven
detection

spatial scene

repr. field (space)

target CoS
field (space)

reference field (space)

target fie l (space)

relational field (relati space)

"blue right of red"

reference color

spatial relation

target color

reference

target

target centered on reference

red

blue

green

cyan

reference color memory

reference processes

attention (space)

spatial scene representation

spatial relation memory

target color memory

red

blue

cyan

green

orange

left

right

above

below

TI

TC

TFI

TFC

TCI

TCC

TMI

TMC

SI

SC

SFI

SFC

SCI

SCC

SMI

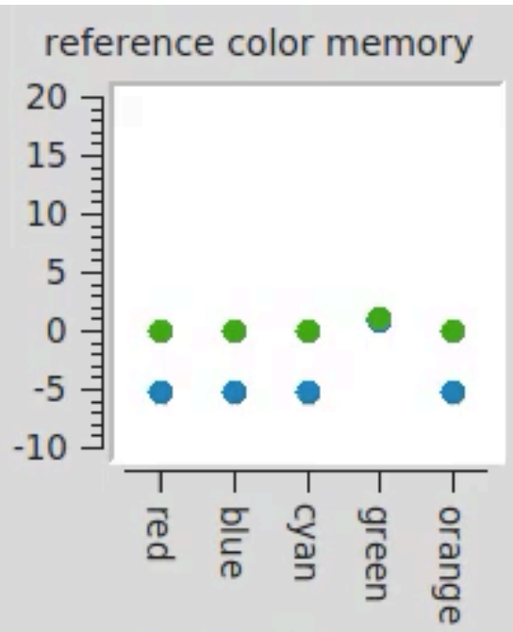
SMC

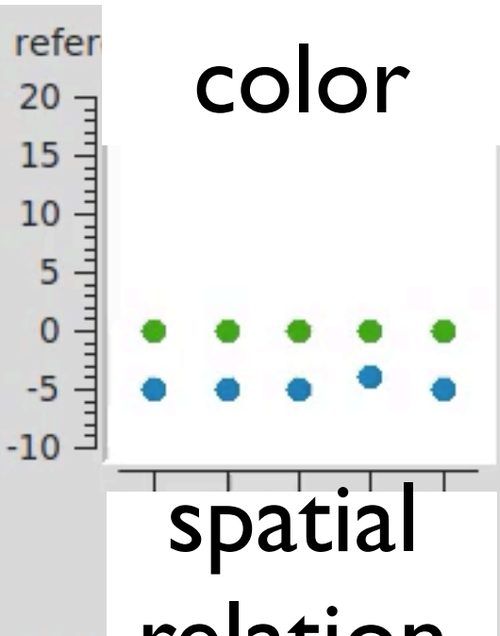
reference color

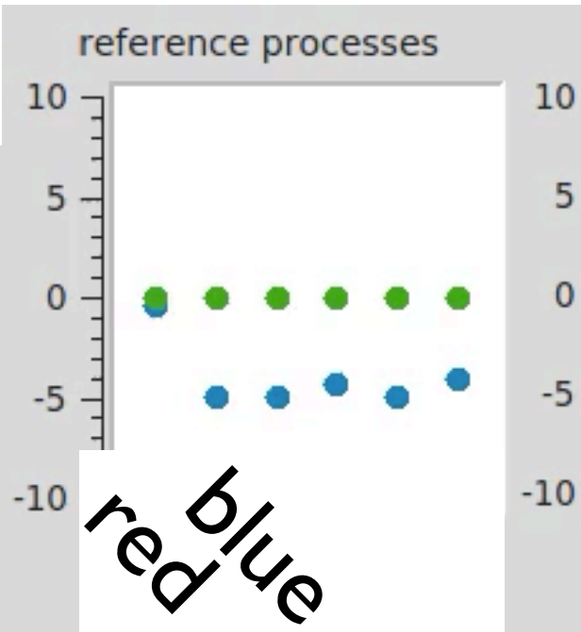
"where is blue relative to green?"

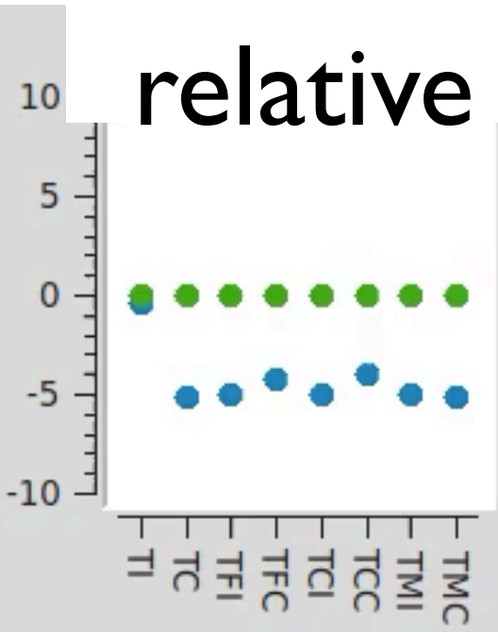
spatial relation

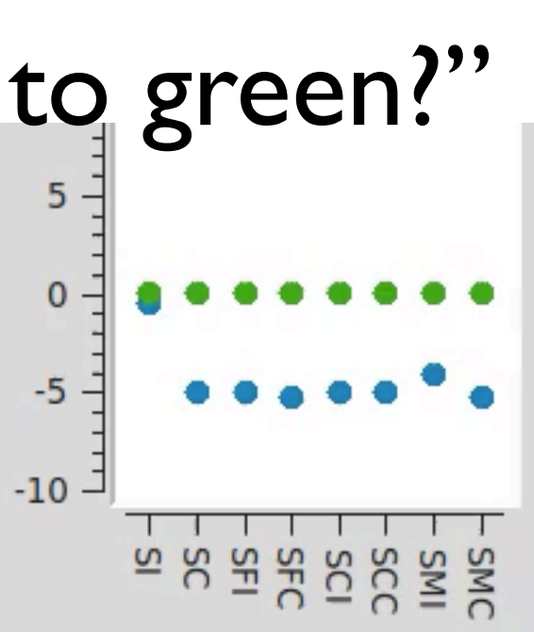
target color

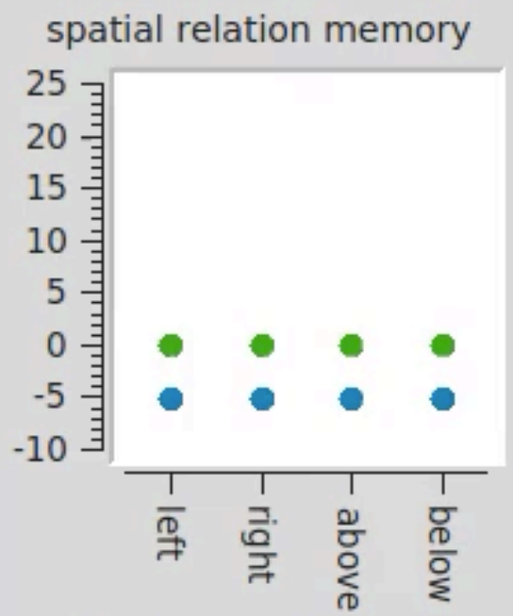


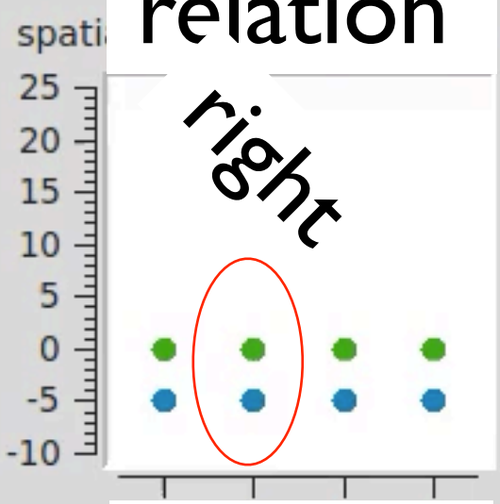


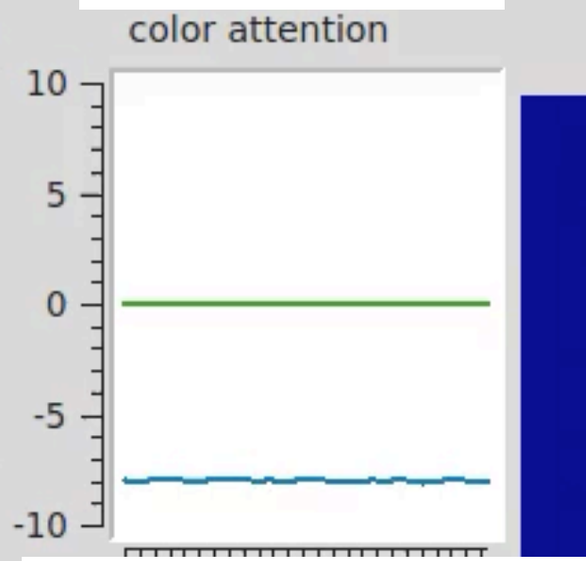


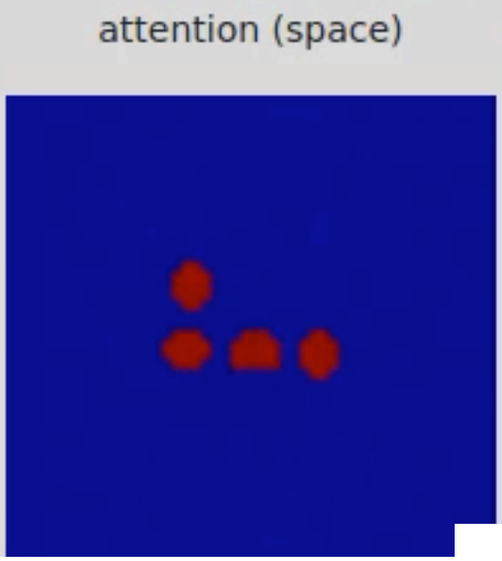


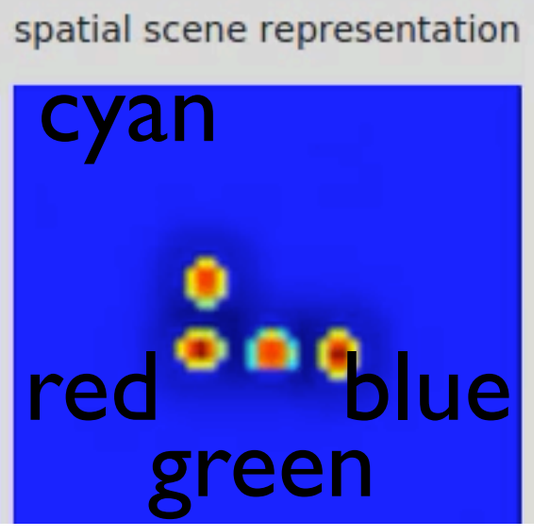


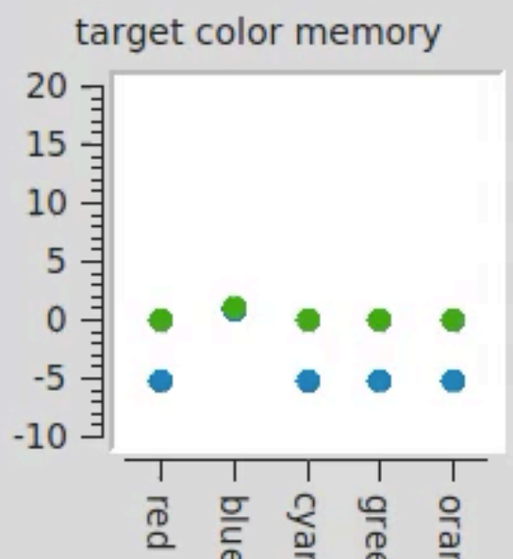


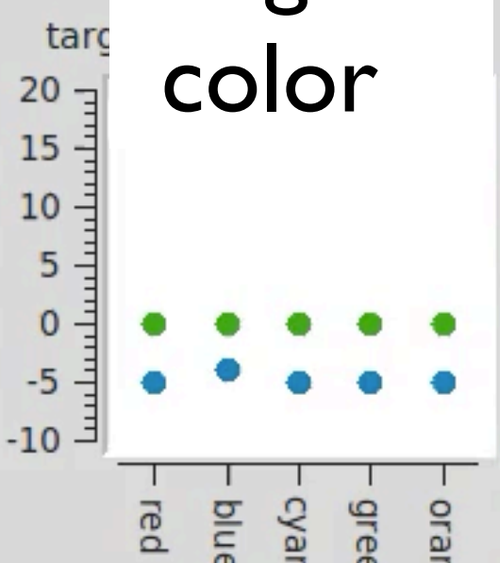






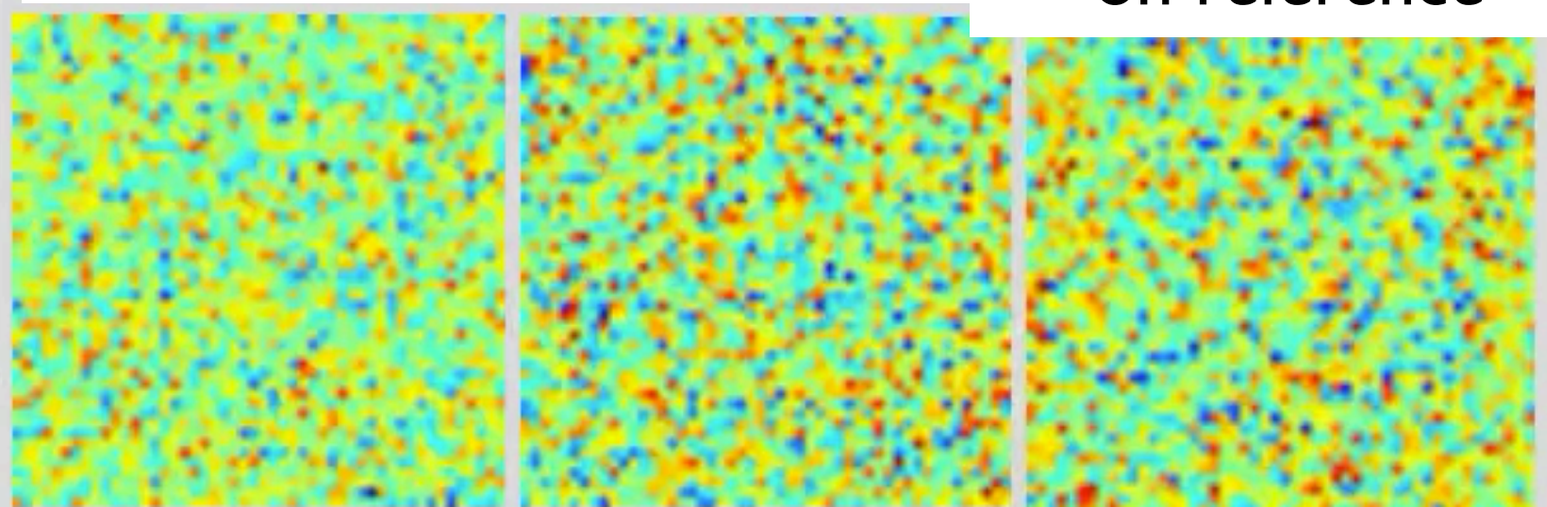






reference target

target centered on reference



How do the sequential processing steps emerge from neural dynamic systems?

- this is an issue in all integrated neural architecture….
- but also a broader issue… lecture on sequence generation