

# Mindreading & Joint Action

## 6. Goal Ascription



butterfillS@ceu.hu

goal ascription

*pure* goal ascription

How could *pure* goal ascription work?

sophisticated theory of  
mind cognition

communication by  
language

(mis)understanding  
ostensive communication

understanding  
distributive goals

understanding  
goals

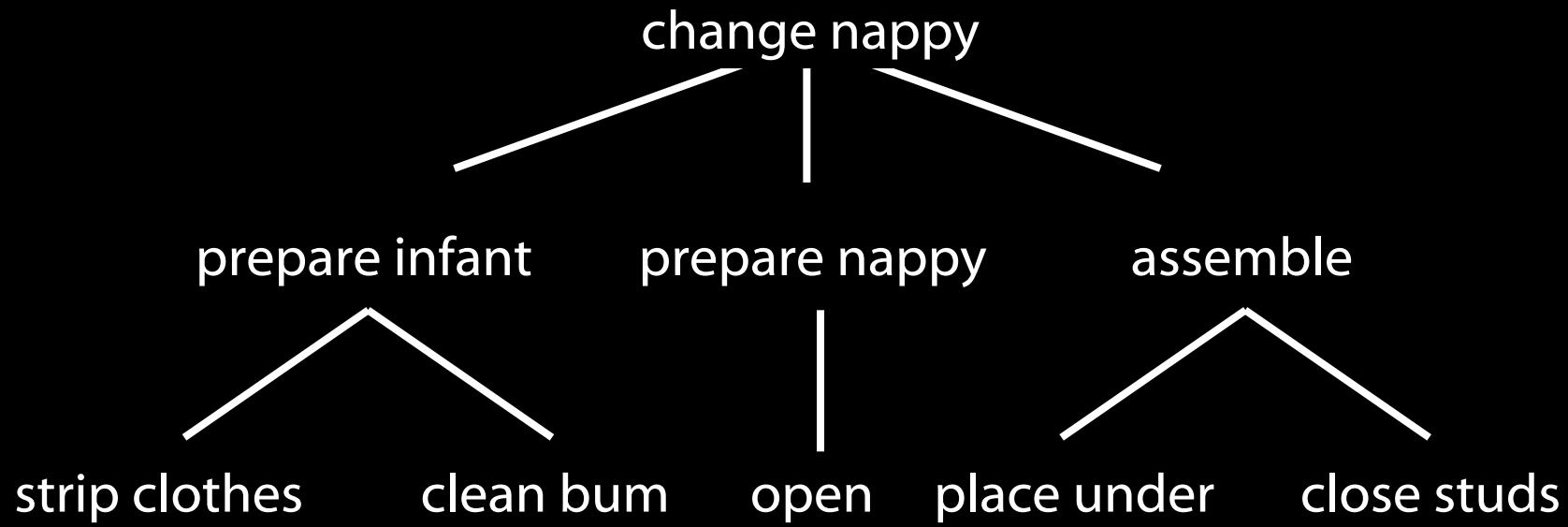
Mindreading is acting in reverse

plans

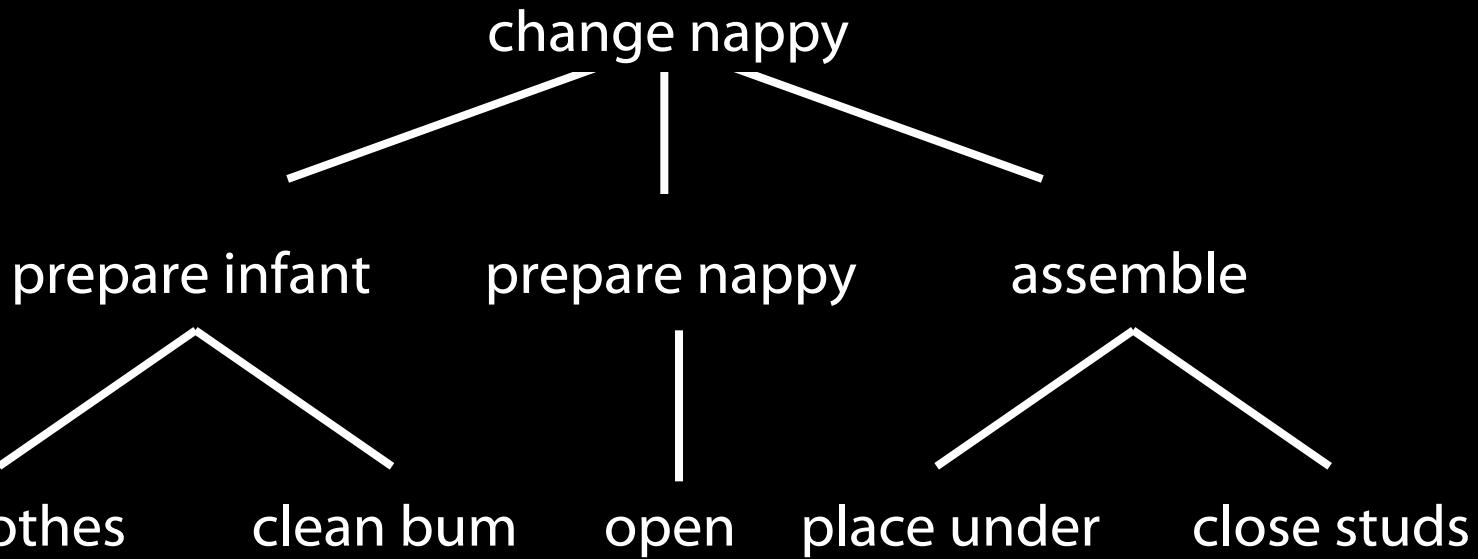


plans

goals



plans



goals

motor action

. /reach X/ /grasp X/ /grasp Y/ /pull Y/ /scoop X/ /Y out of X/ ...

plans



goals

strip clothes      clean bum      open      place under      close studs

motor action

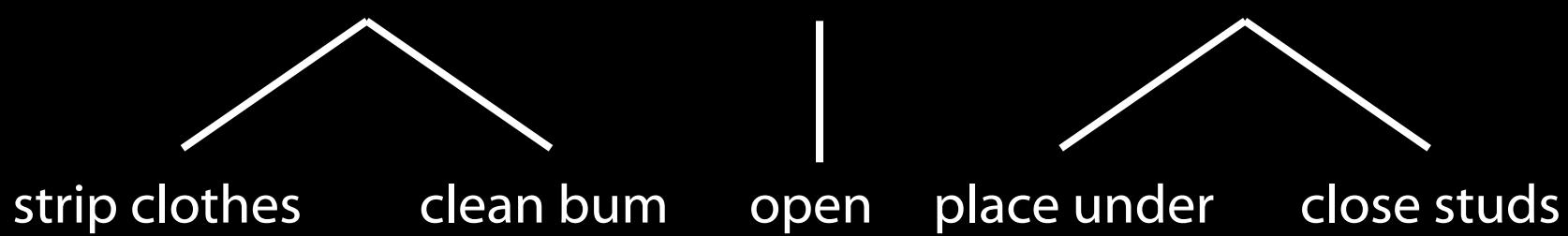
. /reach X/ /grasp X/ /grasp Y/ /pull Y/ /scoop X/ /Y out of X/ ...

[reach-left-hand X] [left-wholehand-grasp X] [right-wholehand-grasp ...]

plans



goals



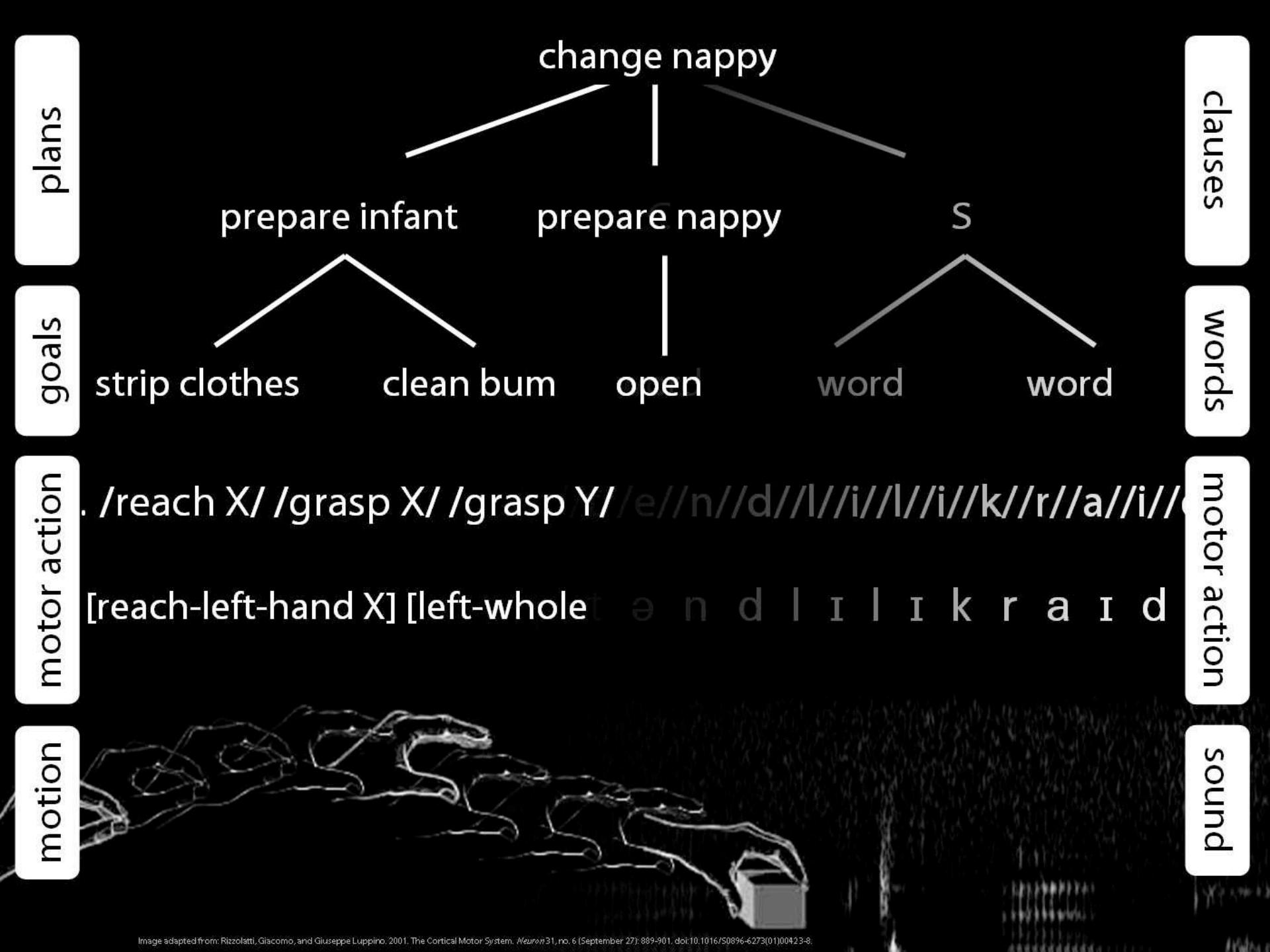
motor action

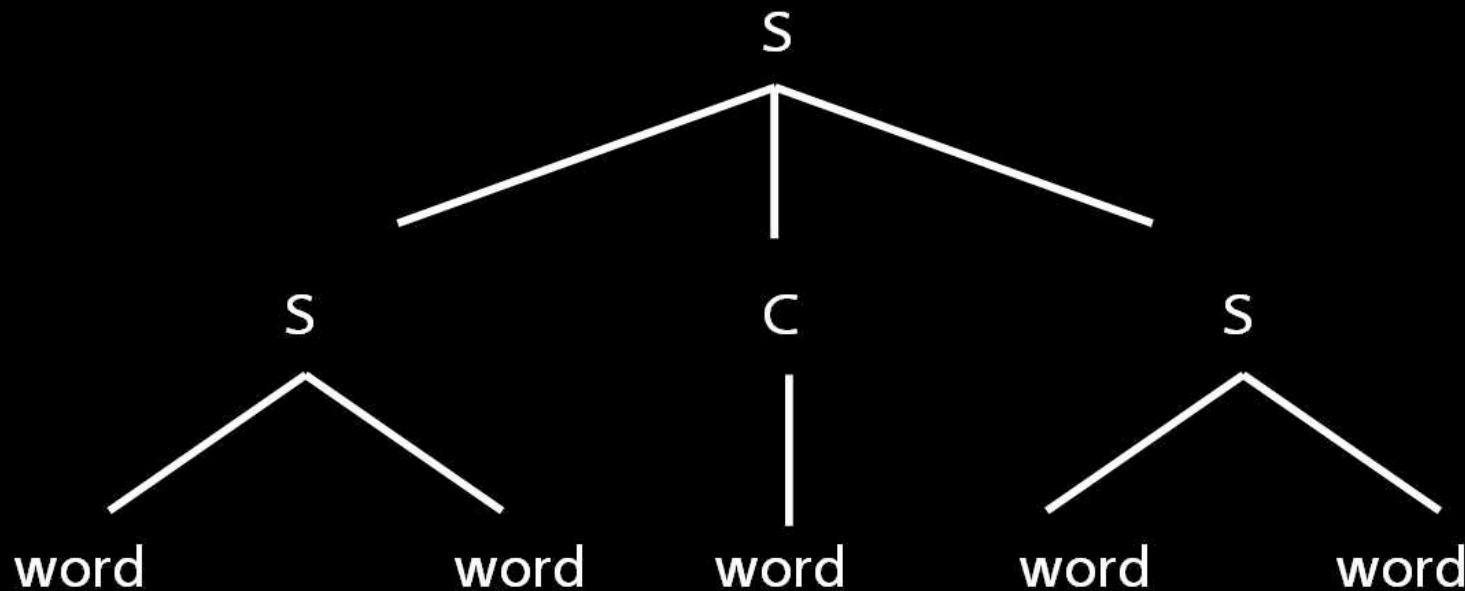
. /reach X/ /grasp X/ /grasp Y/ /pull Y/ /scoop X/ /Y out of X/ ...

[reach-left-hand X] [left-wholehand-grasp X] [right-wholehand-grasp ...

motion

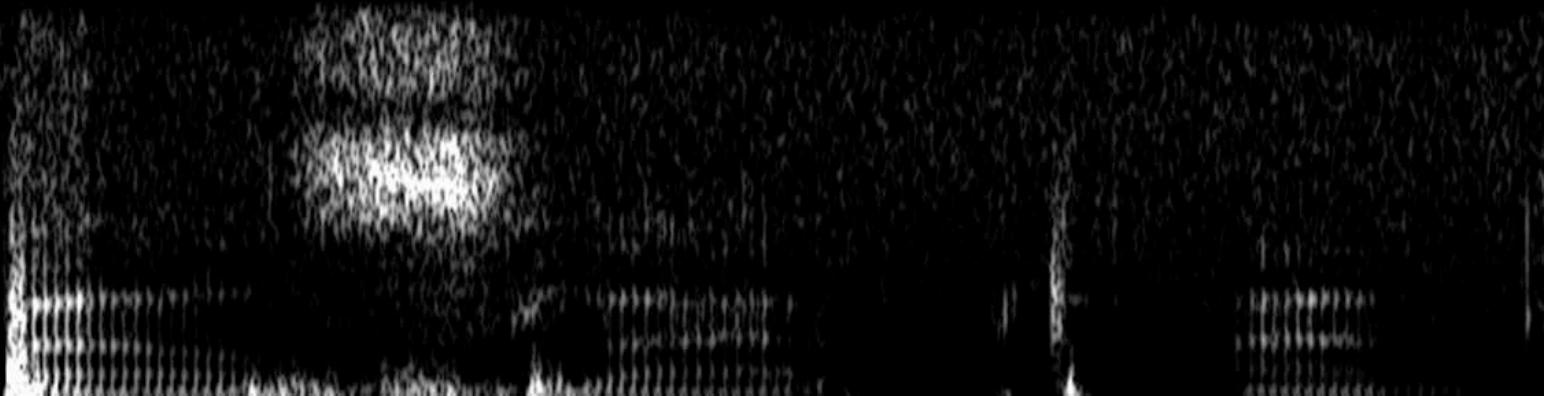


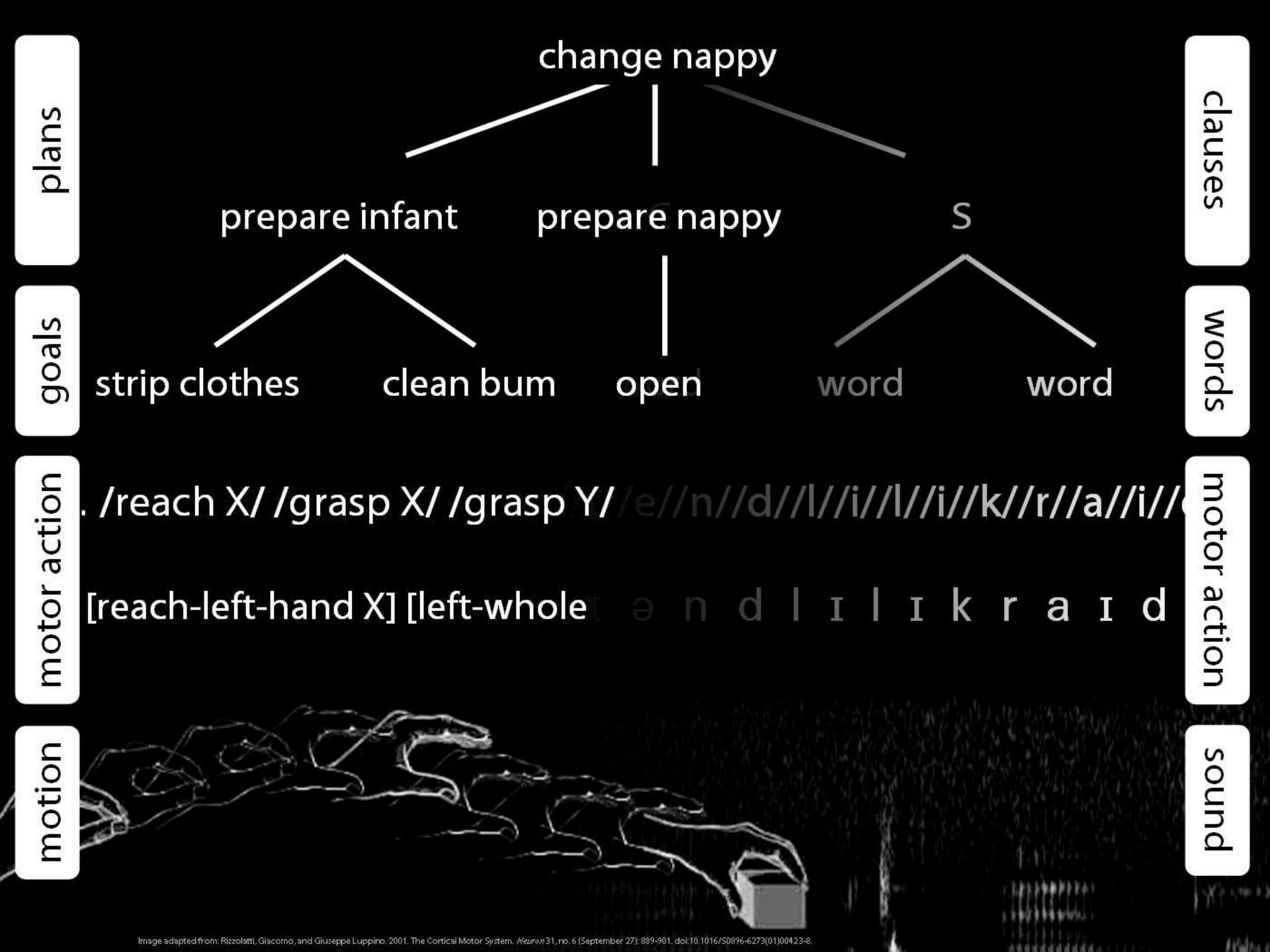




/i//z//e//b//e//l//s//l//e//p//t//e//n//d//l//i//l//i//k//r//a//i//d/

I z e b e l s l e p t e n d l i l i k r a i d

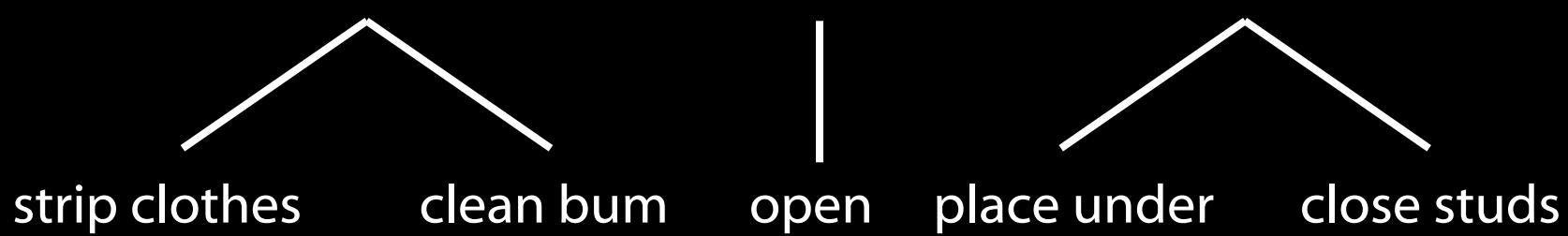




plans



goals



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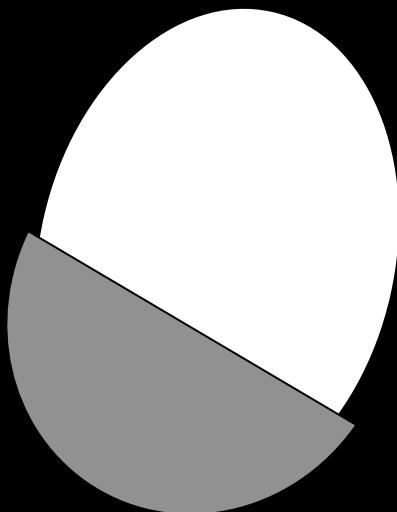


How could *pure* goal ascription work?

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**obstacle**

1. action
2. outcome
3. directedness of  
action to outcome

1. action
2. outcome
3. directedness of  
action to outcome



Ayesha

Beatrice

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1. action

move arm

move arm

2. outcome

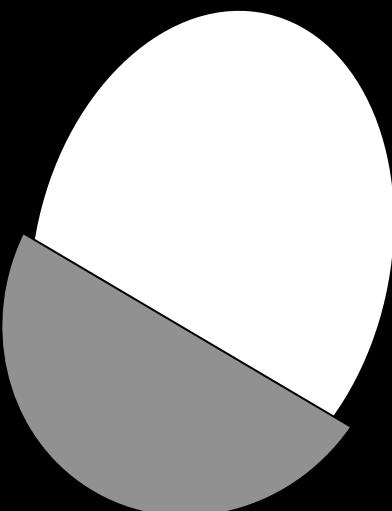
break egg

break egg

3. directedness of  
action to outcome

Y

N



Ayesha

Beatrice

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move arm

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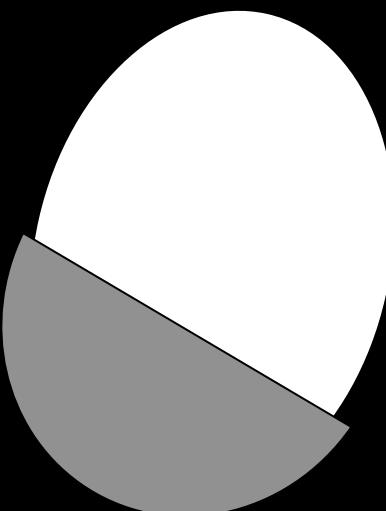
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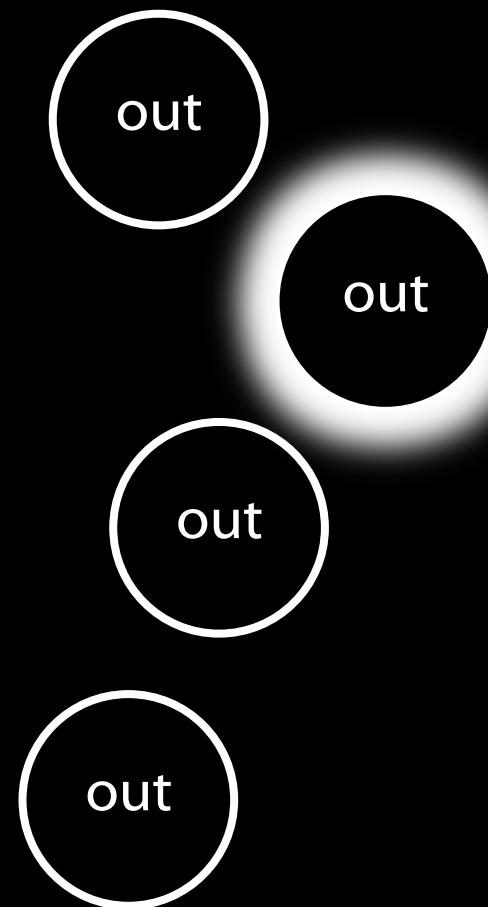
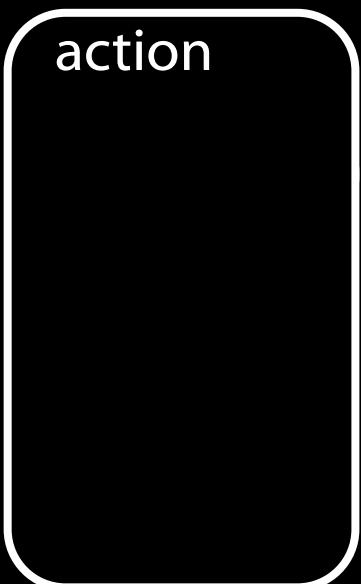
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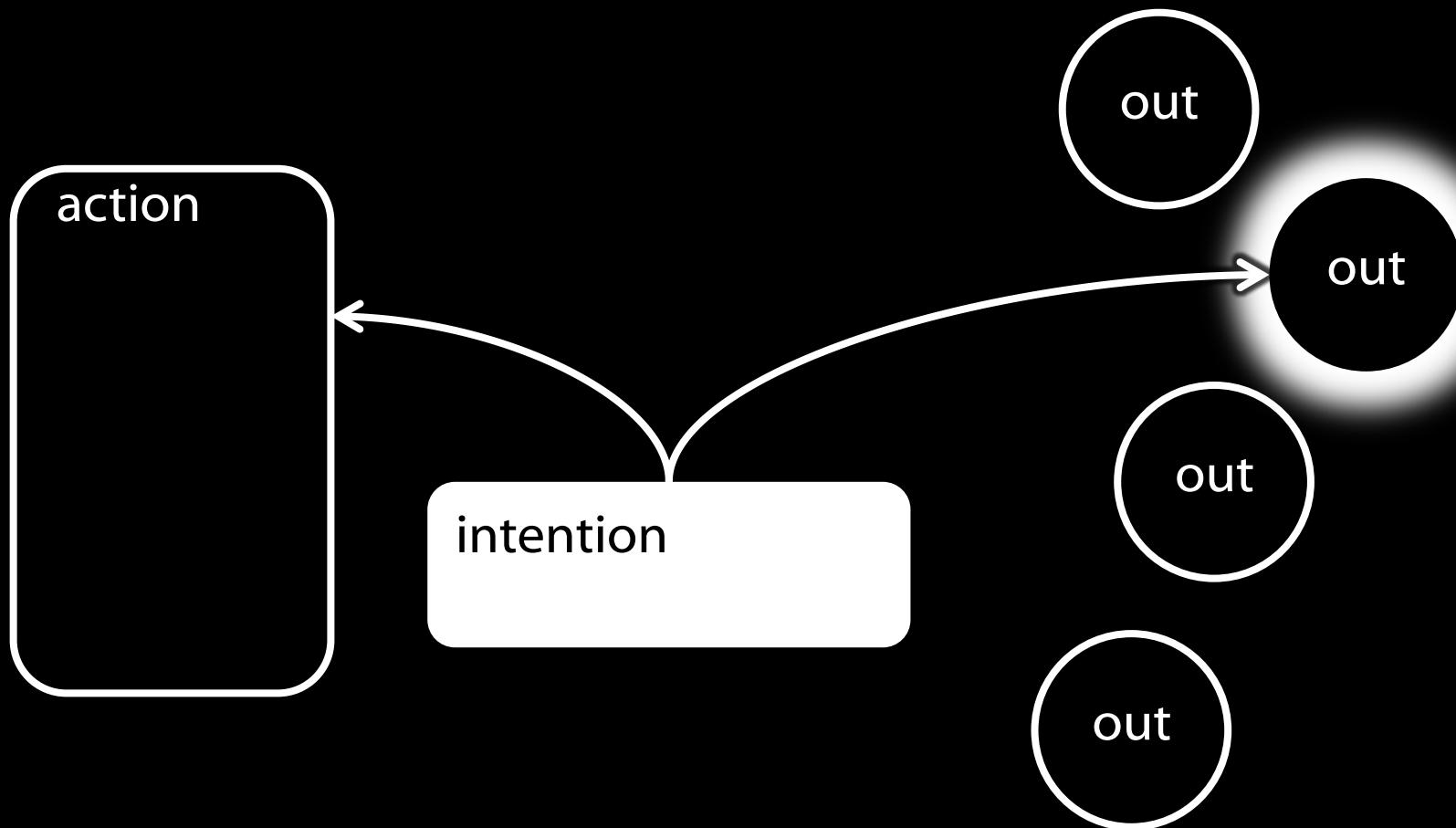


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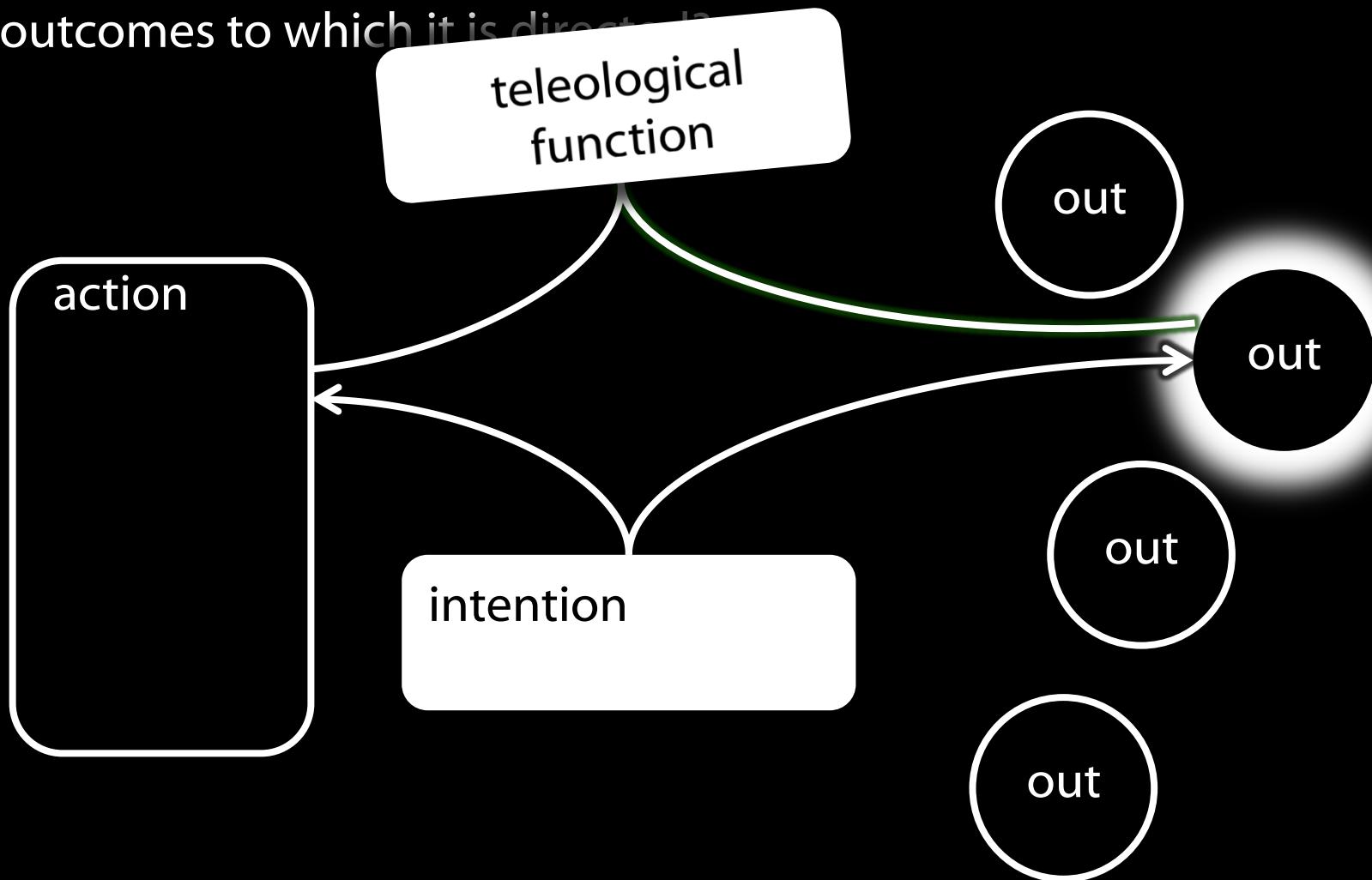
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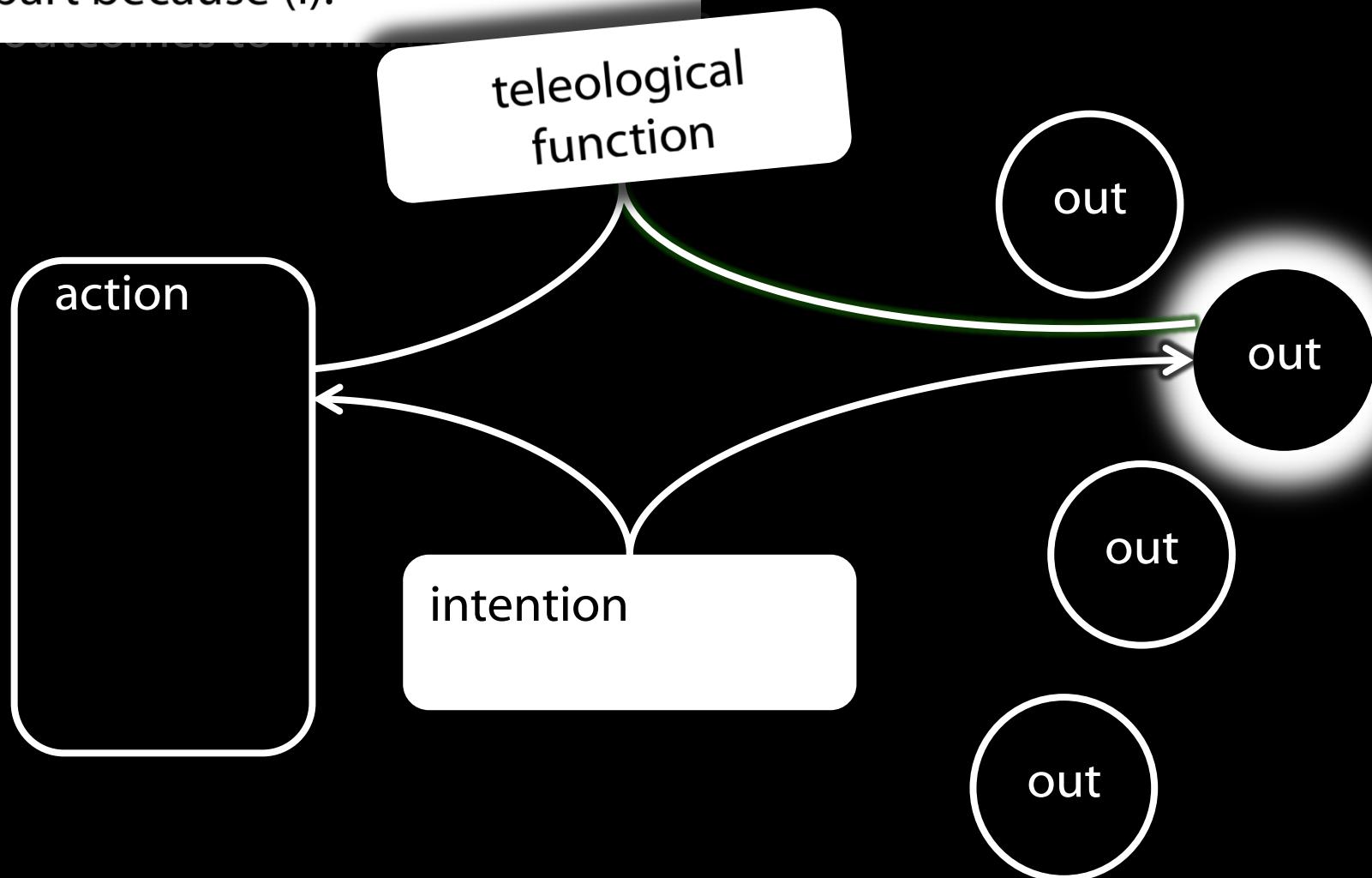


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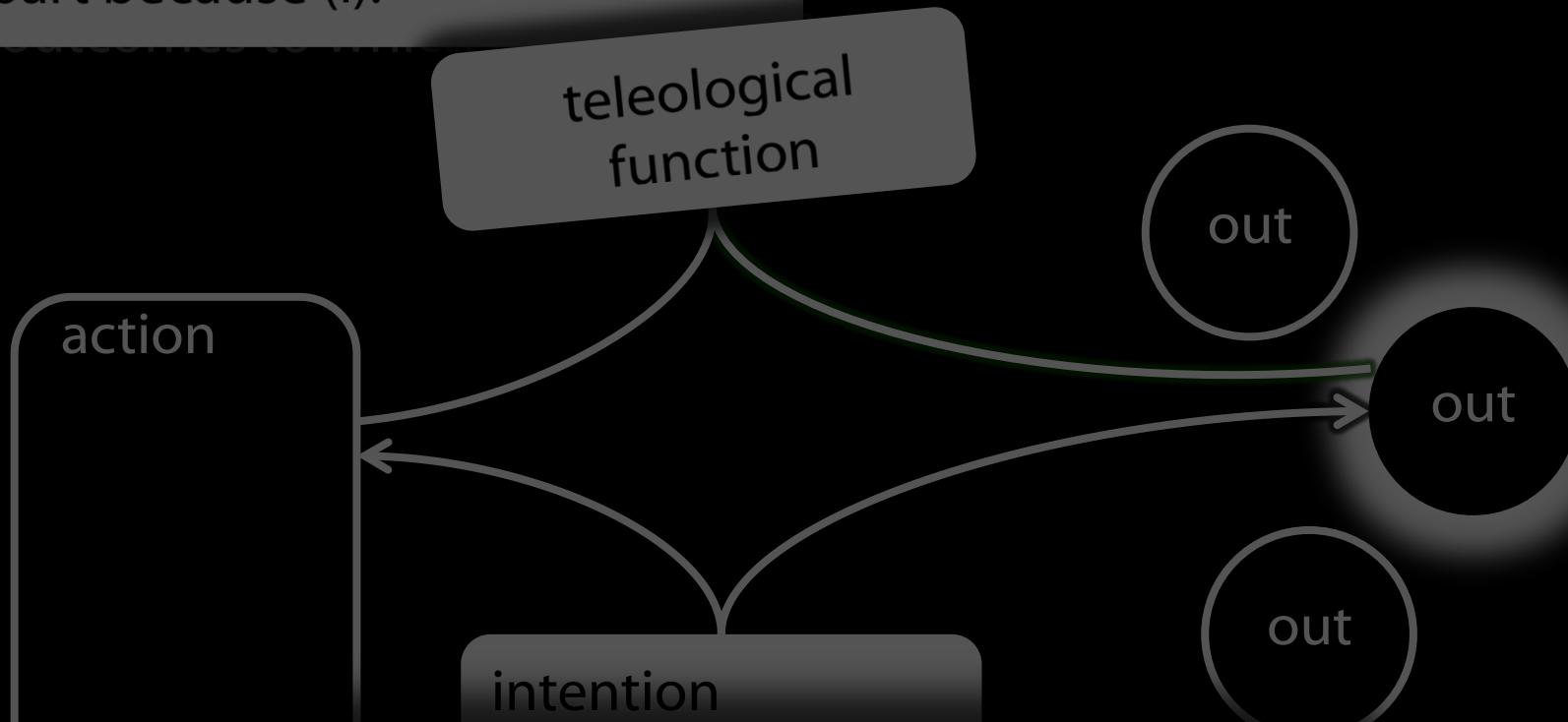
(i) in the past, actions of this type have caused outcomes of this type; (ii) this action happens now in part because (i).

action and the outcome or



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It is possible to represent goal-directed actions without representing intentions.

How could *pure* goal ascription work?  
~~Obstacle~~

'the perceptual origins of theory of mind ... both causality and intention can be traced to perceptual origins'

(Premack 1990: 15)

'in perceiving one object as having the intention of affecting another, the infant attributes to the object a representation of its intentions'

(Premack 1990: 14)

'For the infant, objects ... have intention when their movements are self-propelled. Whereas for common sense, intention is an inferred state of mind based on evidence for desire, belief, and planning.'

(Premack 1990: 12)

'the perceptual origins of theory of mind ... both causality and intention can be traced to perceptual origins'

(Premack 1990: 15)

'in perceiving one object as having the intention of affecting another, the infant attributes to the object a representation of its intentions'

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"chimpanzees understand ... intentions ... perception and knowledge ... Moreover, they understand how these psychological states work together to produce intentional action"

(Call & Tomasello 2008:191)



How could *pure* goal ascription work?

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$R(a,G) =_{df} G$  is the teleological function of  $a$ ?

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(Csibra & Gergely 1998: 255)

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Such calculations require detailed knowledge of biomechanical factors

‘Such calculations require detailed knowledge of biomechanical factors that determine the motion capabilities and energy expenditure of agents. However, in the absence of such knowledge, one can appeal to heuristics that approximate the results of these calculations on the basis of knowledge in other domains that is certainly available to young infants. For example, the length of pathways can be assessed by geometrical calculations, taking also into account some physical factors (like the impenetrability of solid objects). Similarly, the fewer steps an action sequence takes, the less effort it might require, and so infants' numerical competence can also contribute to efficiency evaluation.’

Csibra & Gergely (forthcoming ms p. 8)

Such calculations require detailed knowledge of biomechanical factors

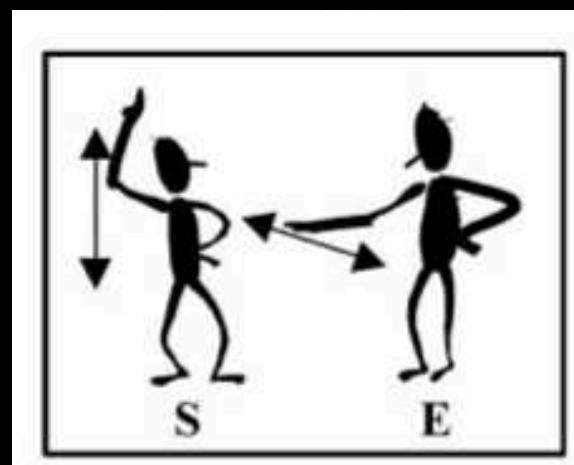
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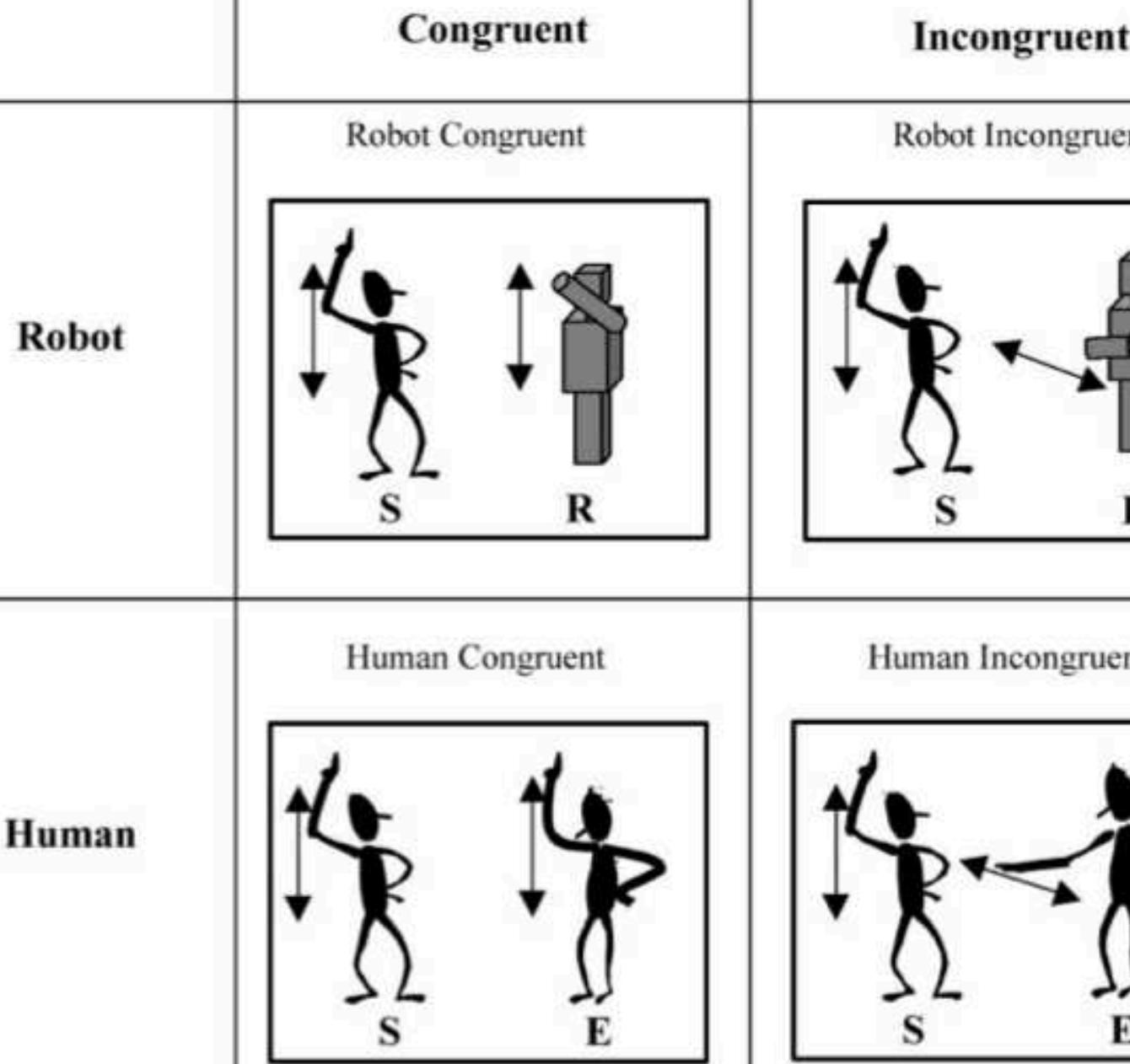
A close-up photograph of a mantis on a purple flower. The mantis is positioned on the right side of the frame, its long, spindly legs and segmented body visible against a blurred background of yellow and purple flowers. Its head is turned towards the left, where a large, vibrant purple flower dominates the foreground. The mantis's long antennae extend upwards and outwards. The overall composition emphasizes the intricate details of the mantis and the delicate beauty of the surrounding flora.

Motor Planning

Motor planning occurs in action observation



*source Kilner et al (2003)*

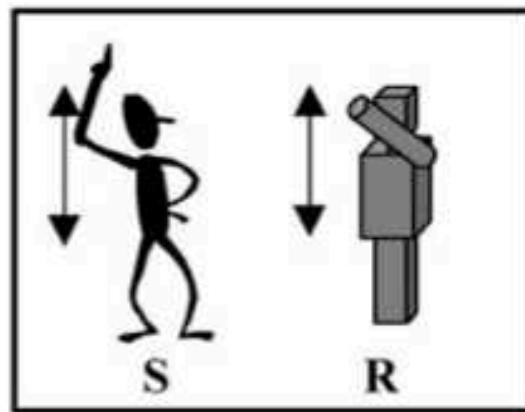


source Kilner et al (2003)

**Congruent**

Robot Congruent

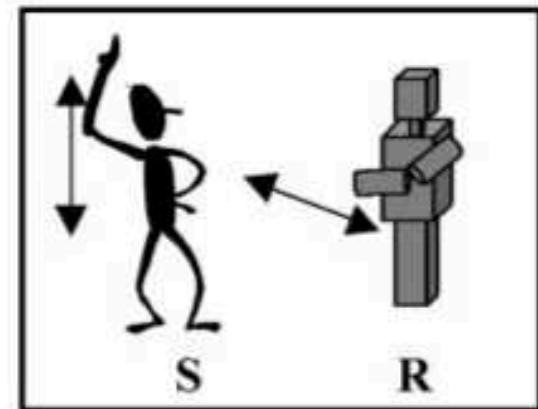
**Robot**



**Incongruent**

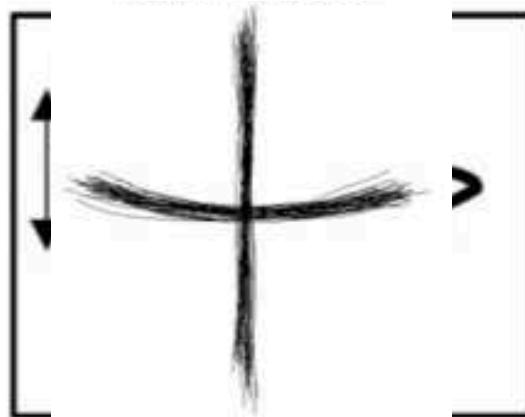
Robot Incongruent

**R**



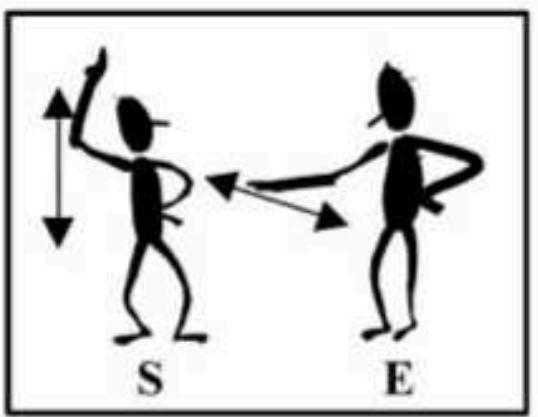
Human Congruent

**Human**



Human Incongruent

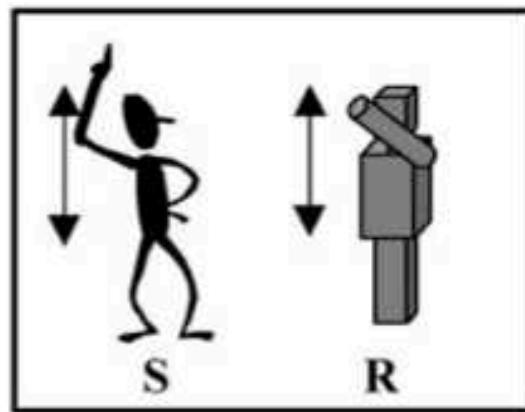
**E**



source Kilner et al (2003)

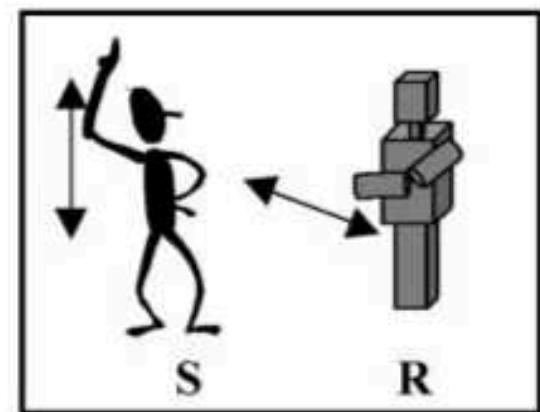
**Congruent**

Robot Congruent



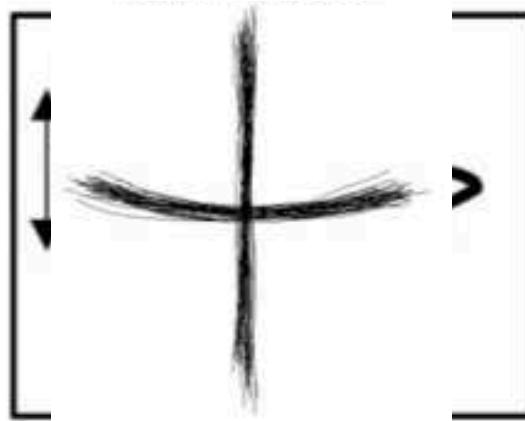
**Incongruent**

Robot Incongruent

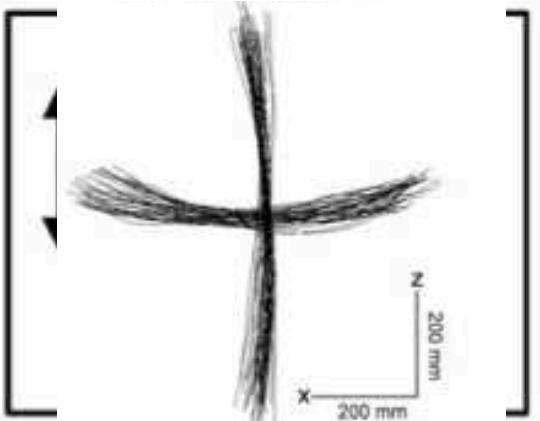


**Robot**

**Human Congruent**

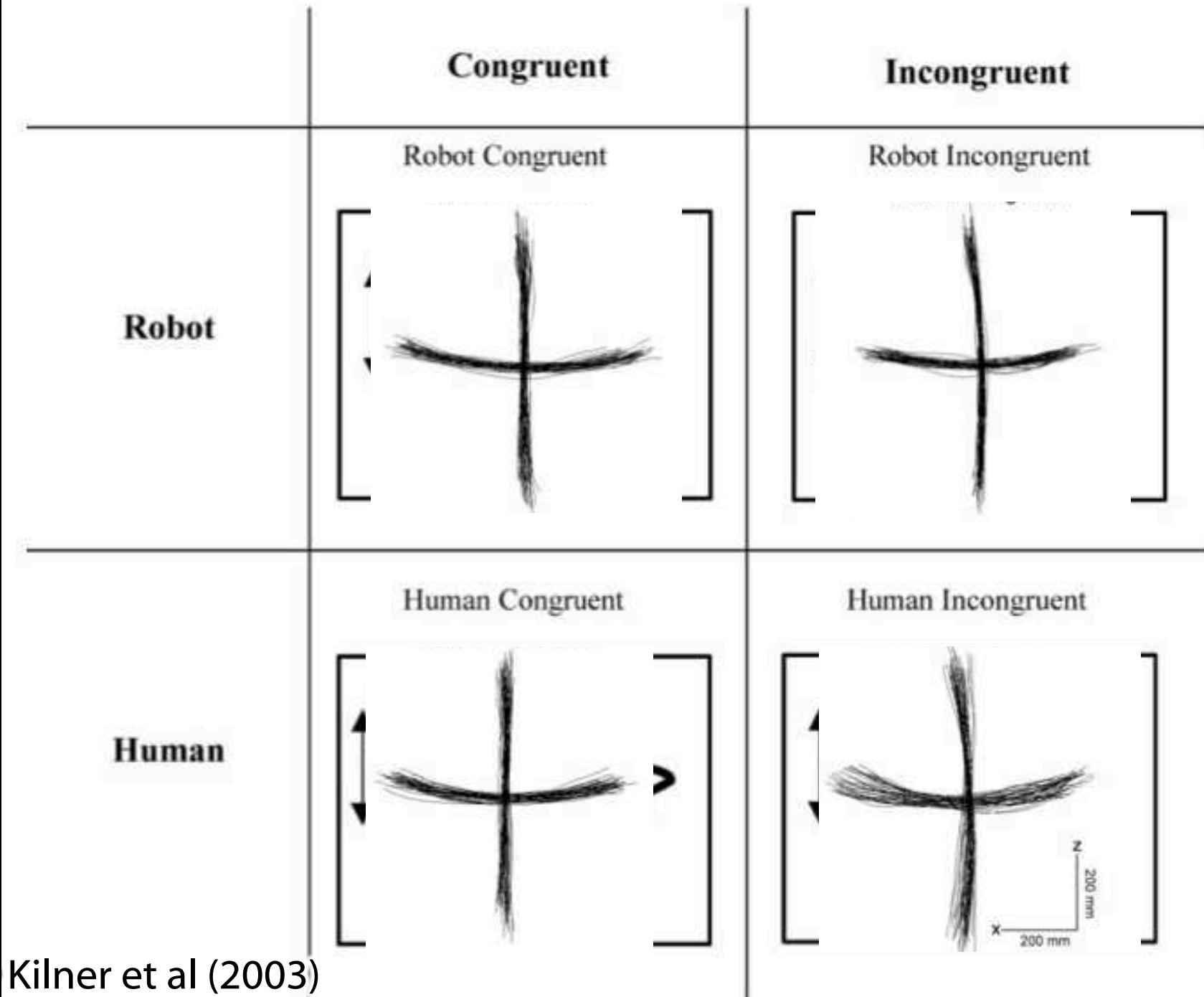


**Human Incongruent**

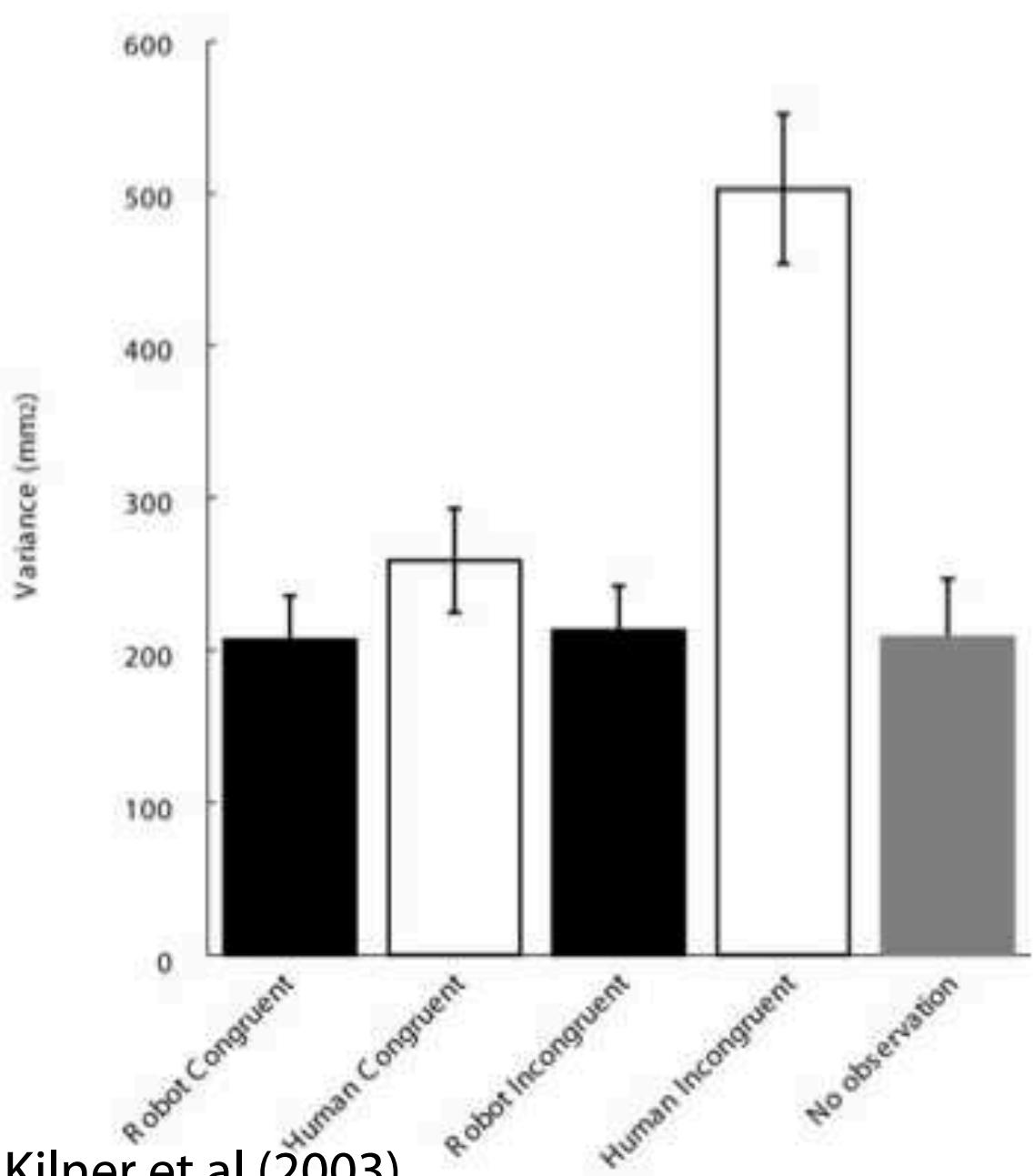


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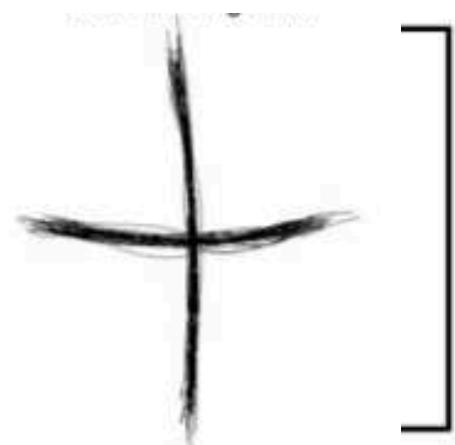


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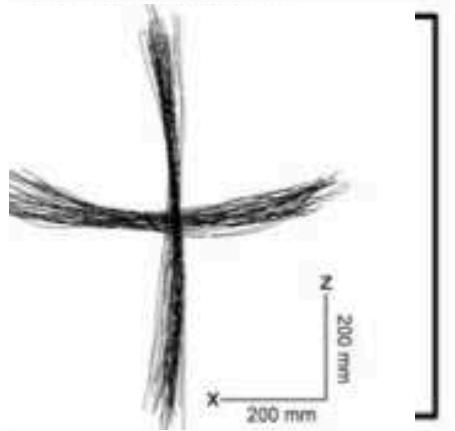


**Incongruent**

Robot Incongruent



Human Incongruent



source Kilner et al (2003)



source Costantini,Ambrosini,Cardelluccio & Sinigaglia (2012)

Motor planning can facilitate goal judgments

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Training effects (Casile & Giese 2006)

TMS to motor cortex slows goal judgments (Urgesi et al 2007)

Hemiplegia with inaccuracy in corresponding goal judgments  
(Serino et al 2009)

Limb vs buccofacial apraxia (Pazzaglia)

# Planning as Goal Ascription

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'goal attribution requires that agents expend the least possible amount of energy within their motor constraints to achieve a certain end'

(Southgate et al, 2008: 1061)

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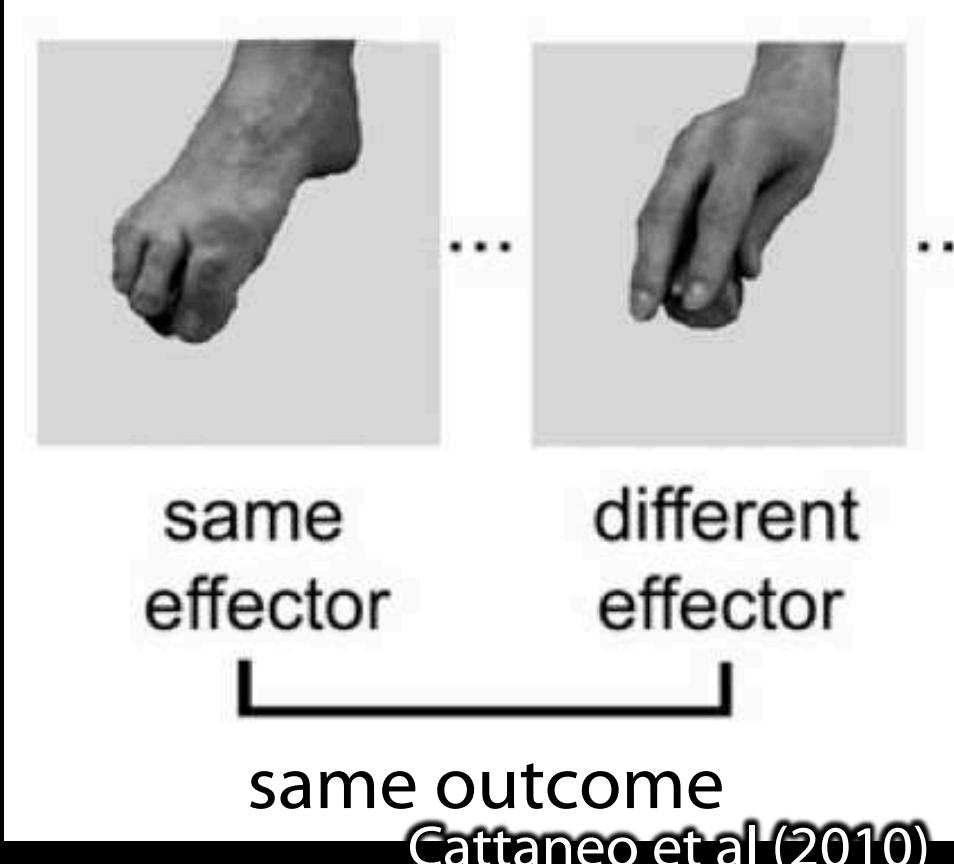
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Some motor representations carry information about outcomes.

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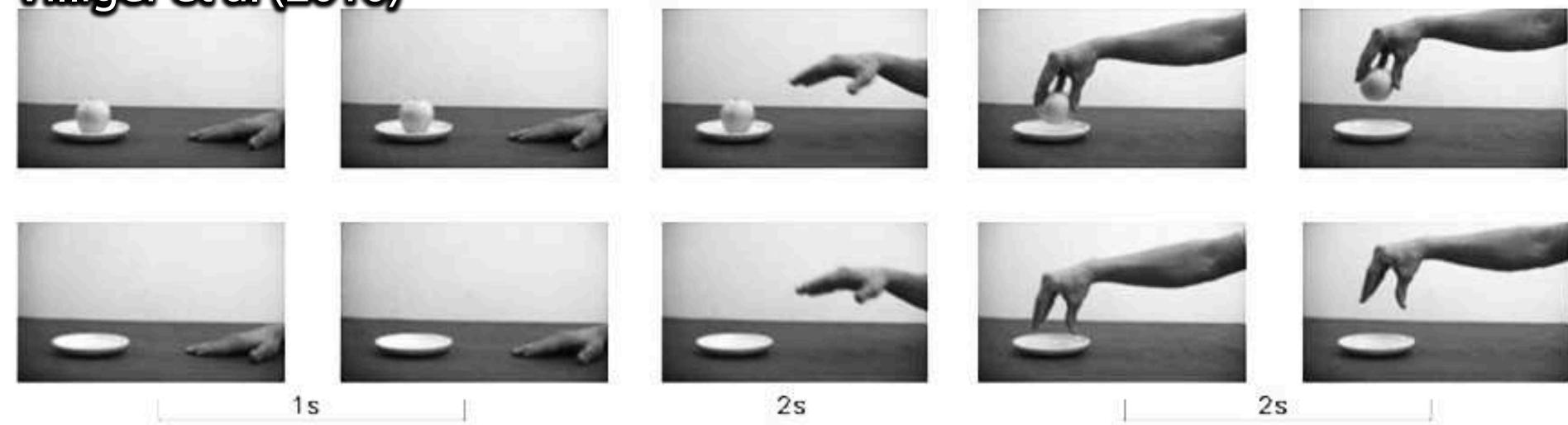
same  
effector

different  
effector

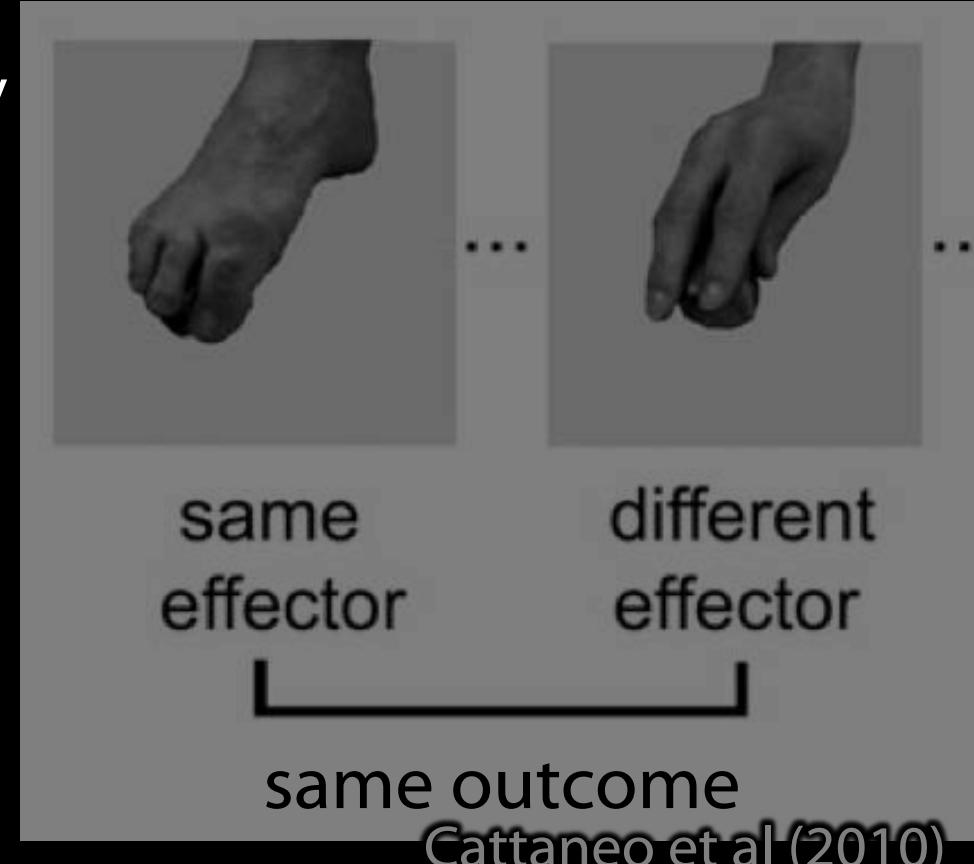
same outcome

Cattaneo et al (2010)

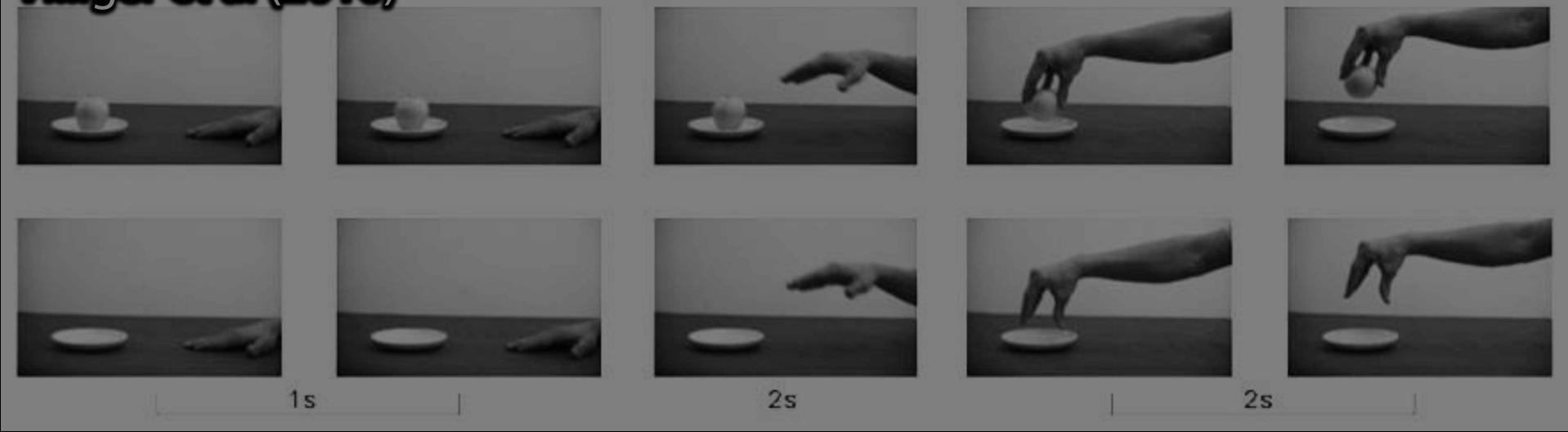
Villiger et.al.(2010)



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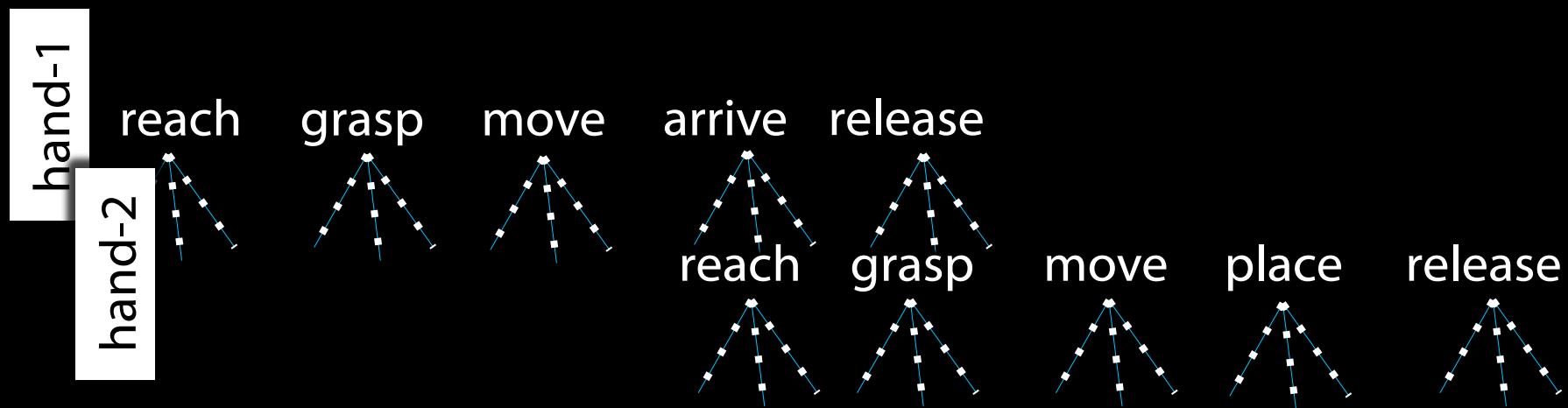


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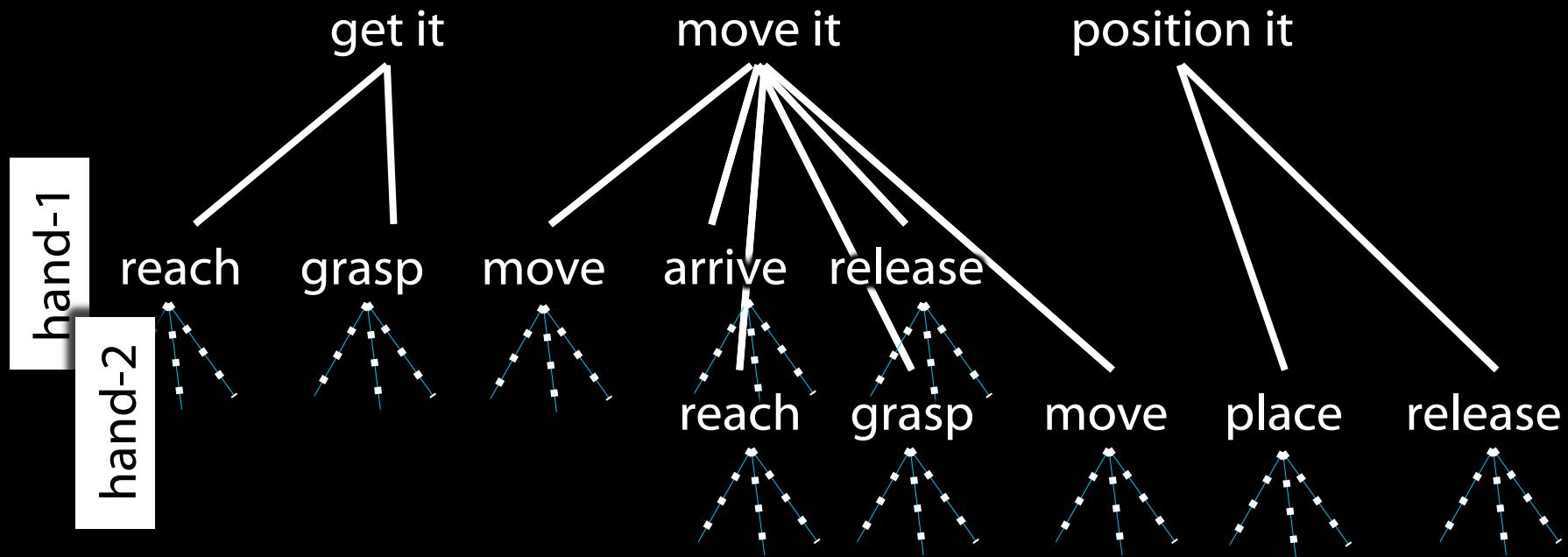
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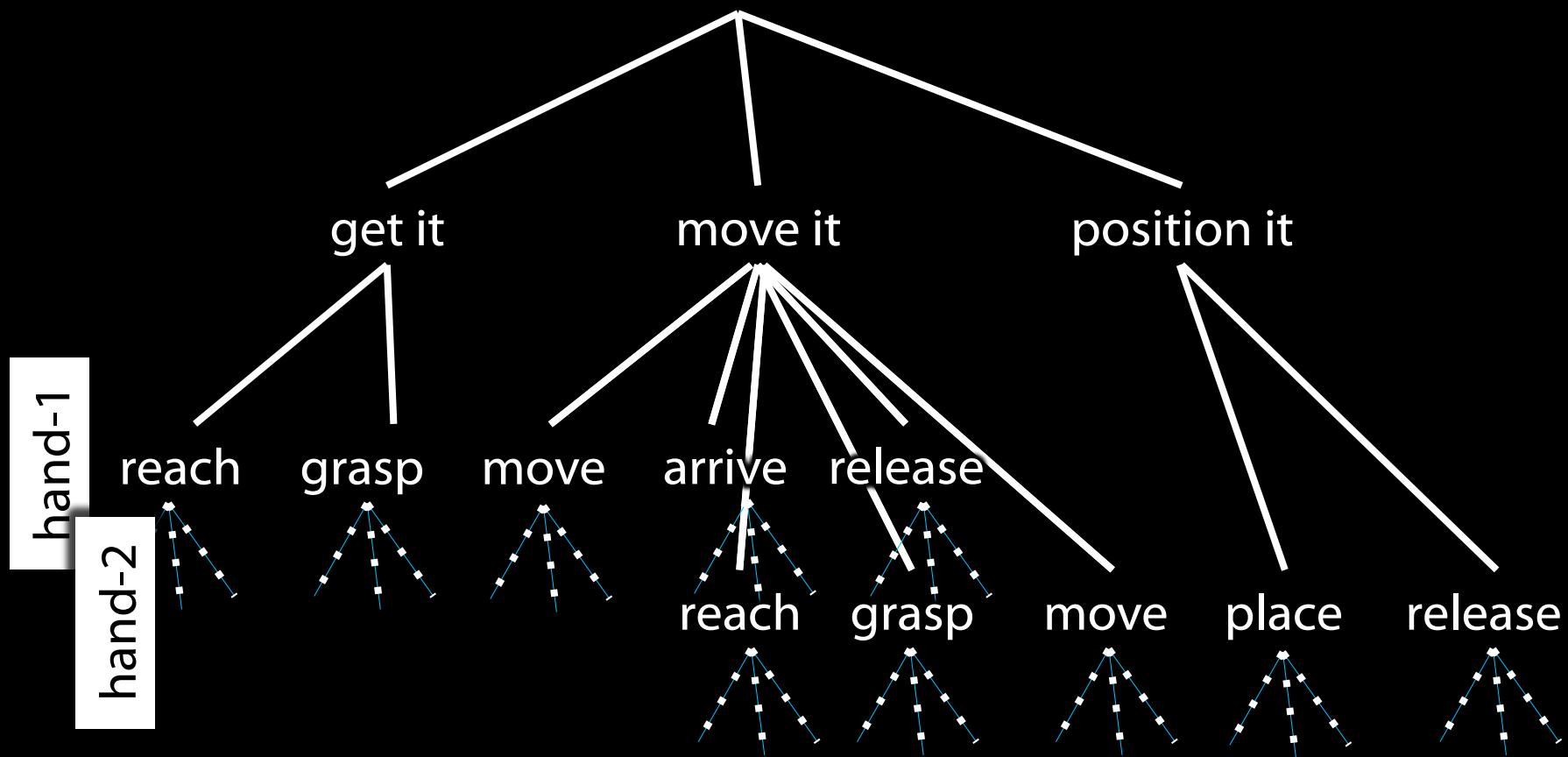
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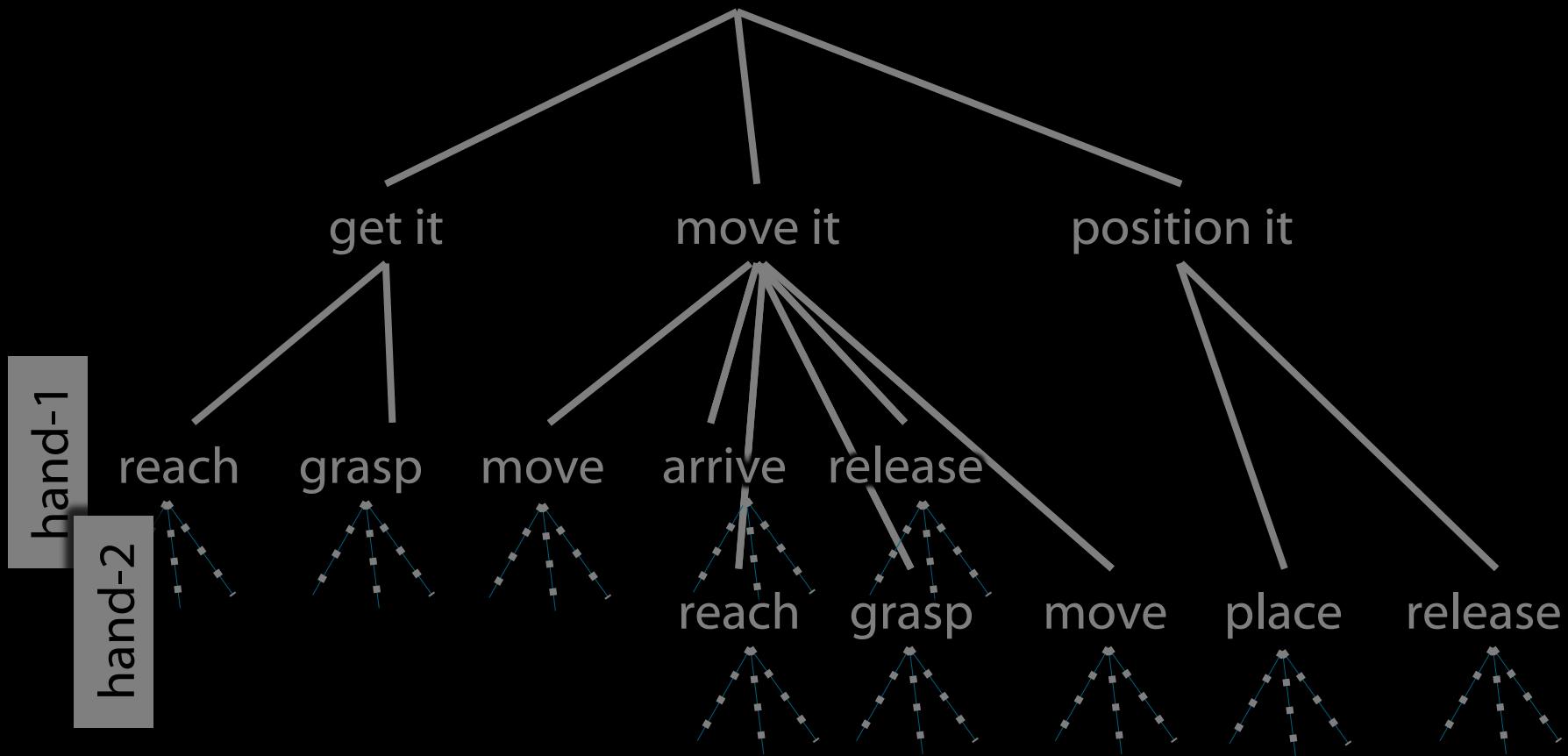
Move it from there to here



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Move it from there to here

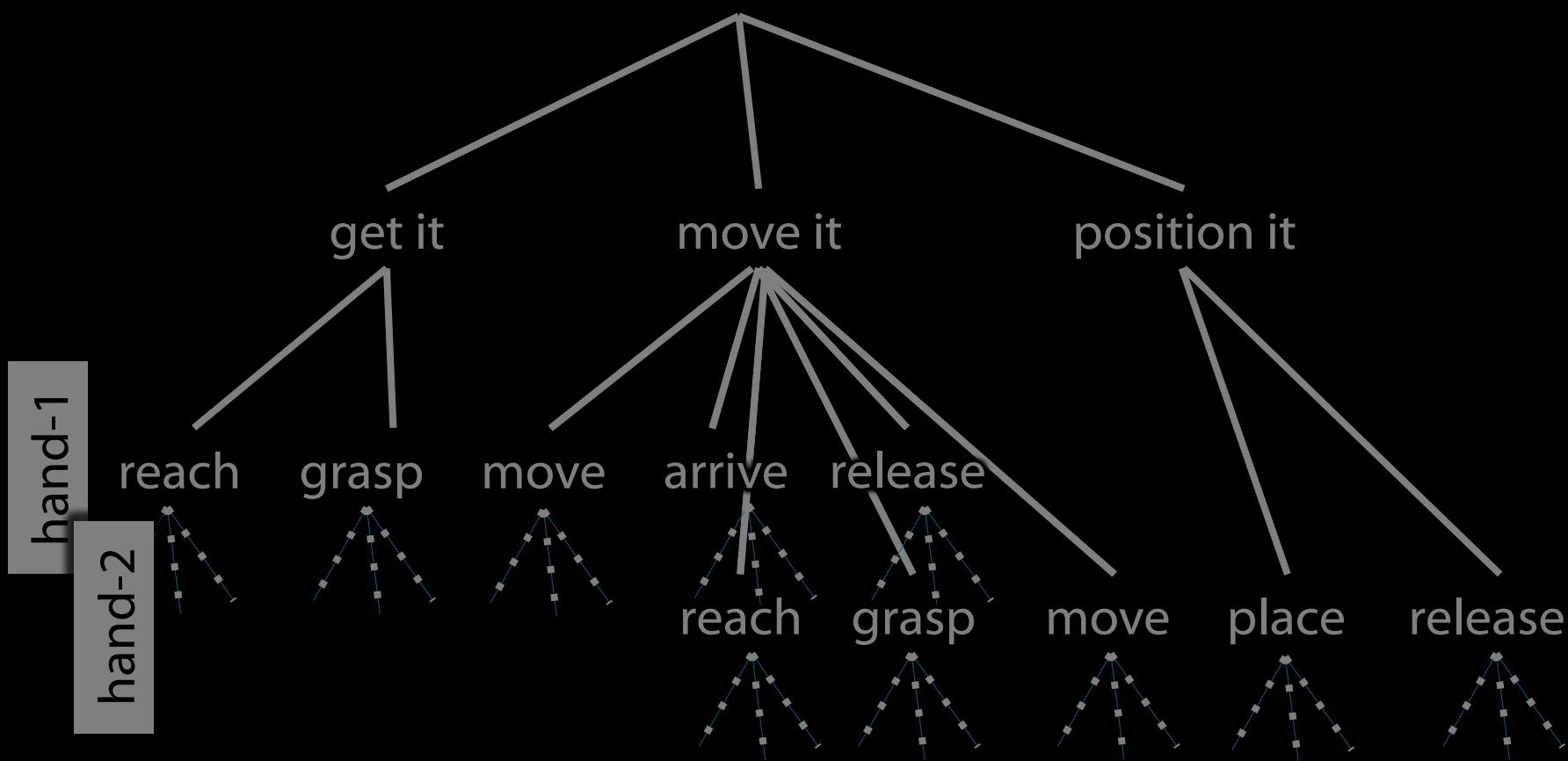


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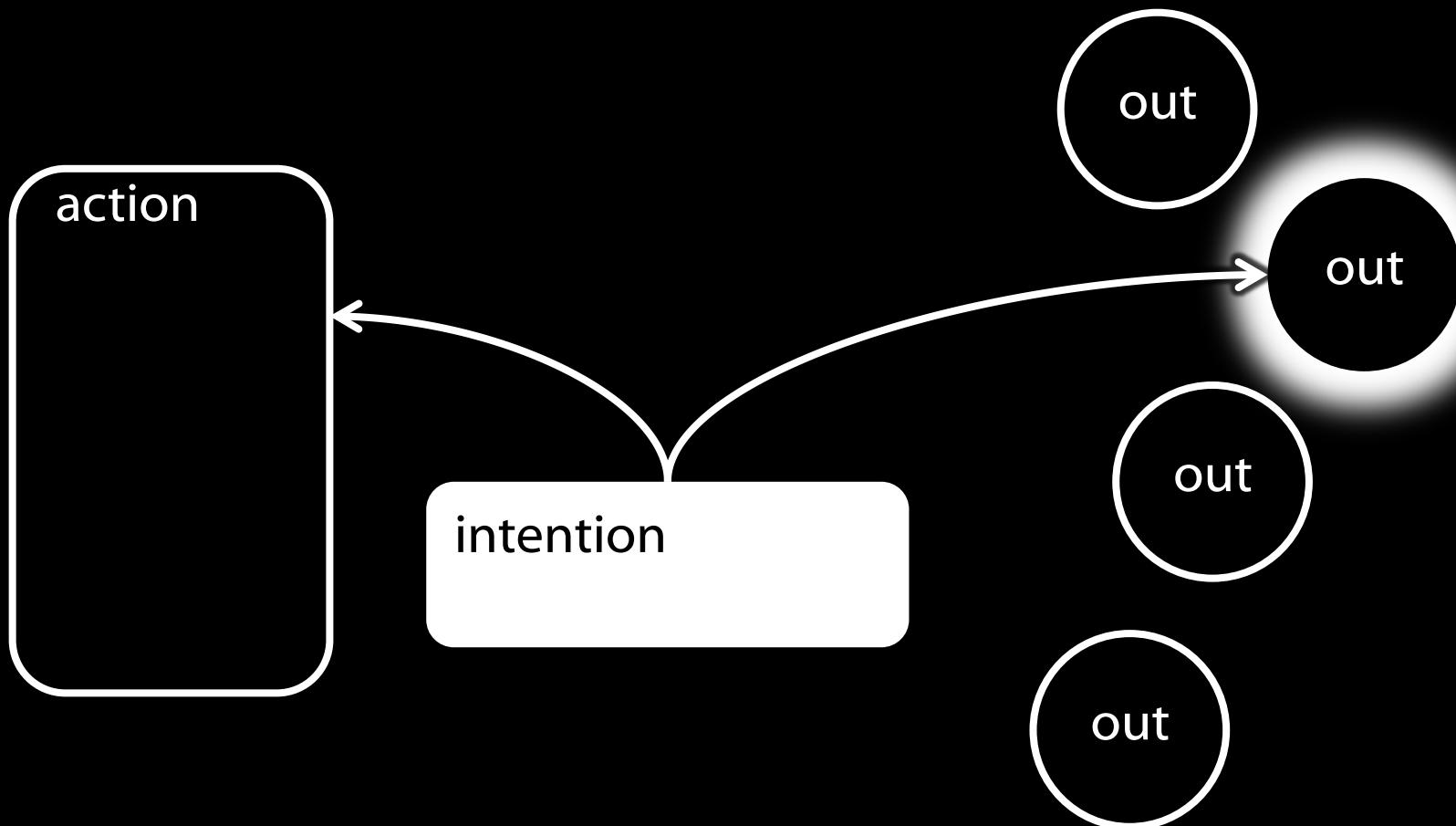
Information about outcomes guides planning.

Some motor representations represent outcomes

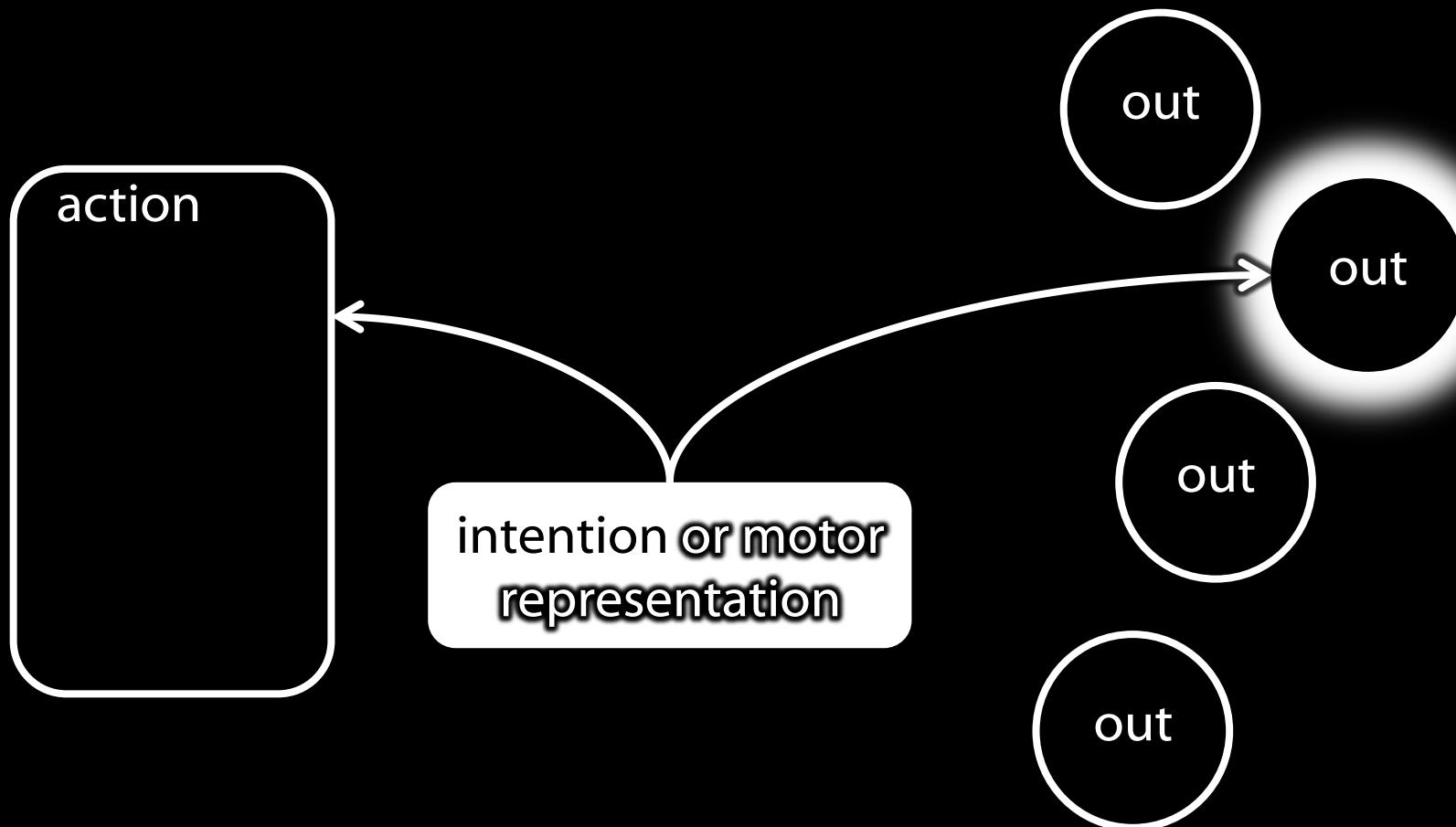
Move it from there to here



What is the relation between a purposive action and the outcome or outcomes to which it is directed?



What is the relation between a purposive action and the outcome or outcomes to which it is directed?



motor representation = intention ?

motor representation = intention ? No !

< different content >



< different content >

Head down Rue Cujas  
toward Rue Victor  
Cousin. Turn right onto  
Rue Saint-Jacques....

Take RER B and get out  
at the Luxembourg  
station, from there it's  
less than 5 minutes  
walk.



< different format >

Head down Rue Cujas  
toward Rue Victor  
Cousin. Turn right onto  
Rue Saint-Jacques....



< different format >



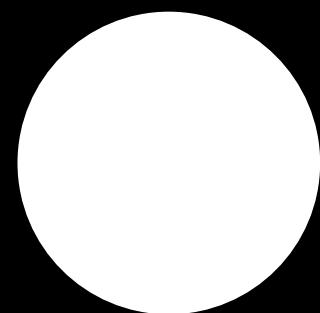
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toward Rue Victor  
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Rue Saint-Jacques....

e.g. rapid identification  
of key landmarks; slow  
translation into  
compass directions

Rapid identification of  
direction of start from  
end (projection-  
dependent)

< different performance >

imagine  
seeing



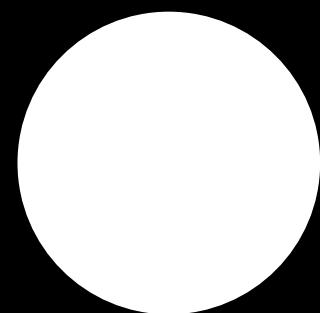
imagine

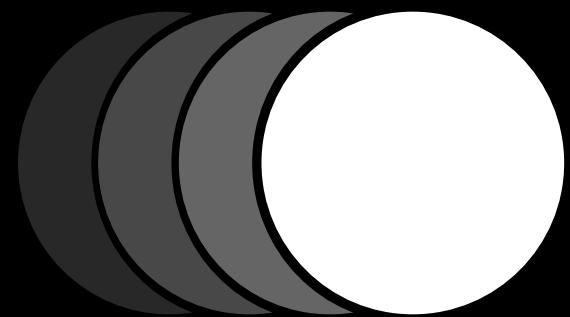
actually

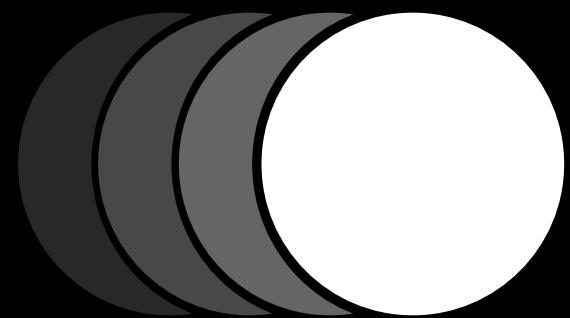
seeing

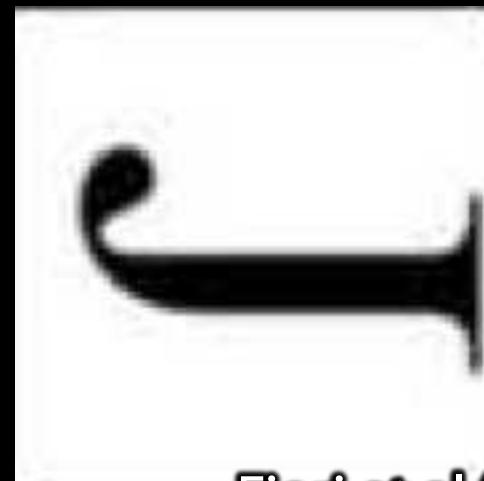
seeing

1

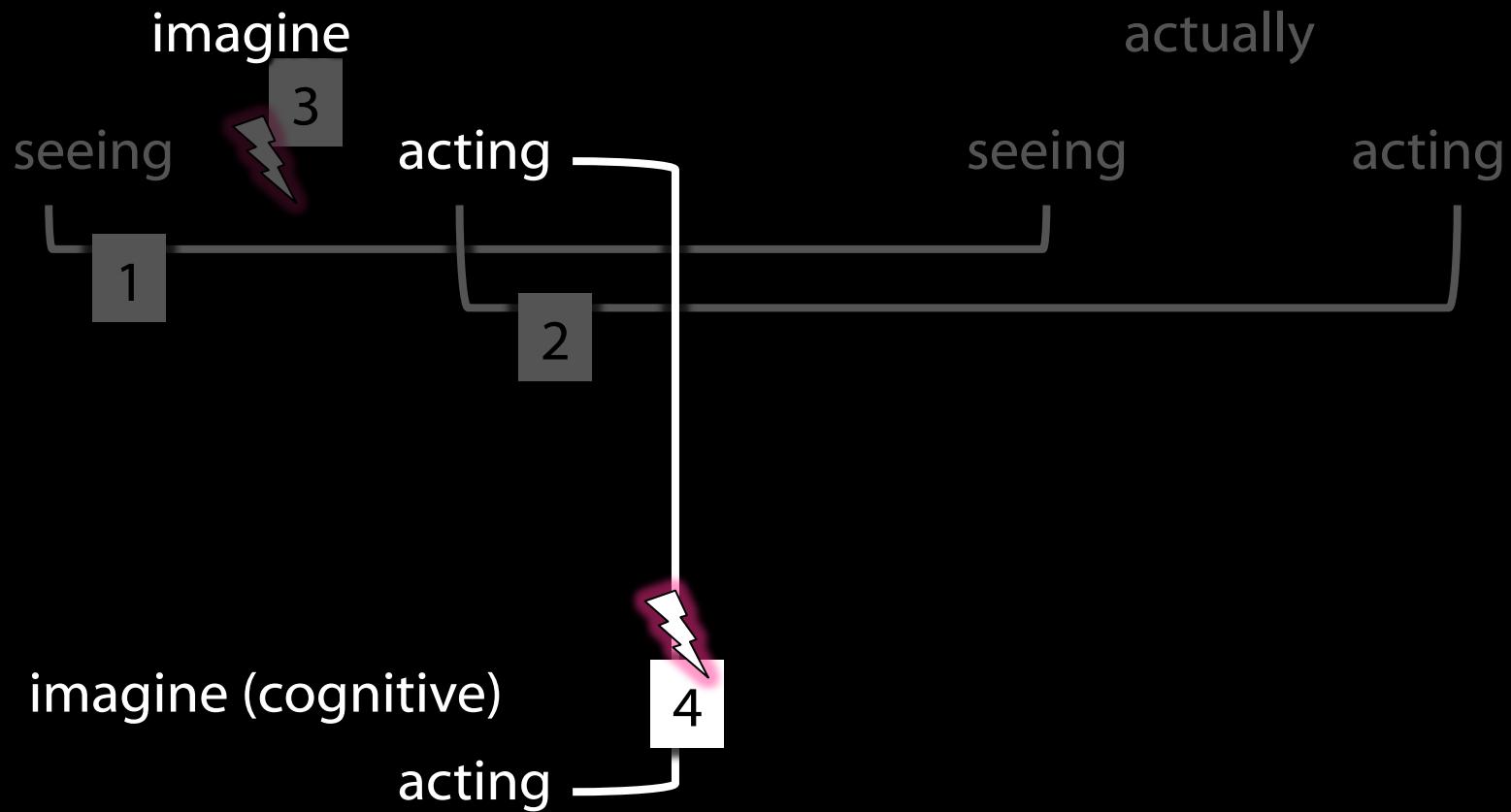








Fiori et al (submitted)



No motor representations are propositional attitudes.

Only representations with a common format can be inferentially integrated.

Any two intentions can be inferentially integrated in practical reasoning.

My intention that I visit Glasgow on Monday is a propositional attitude.

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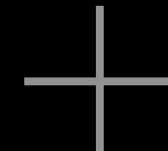
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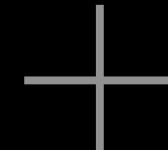
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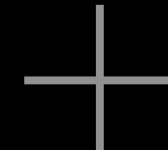
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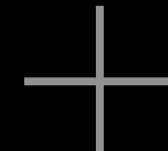
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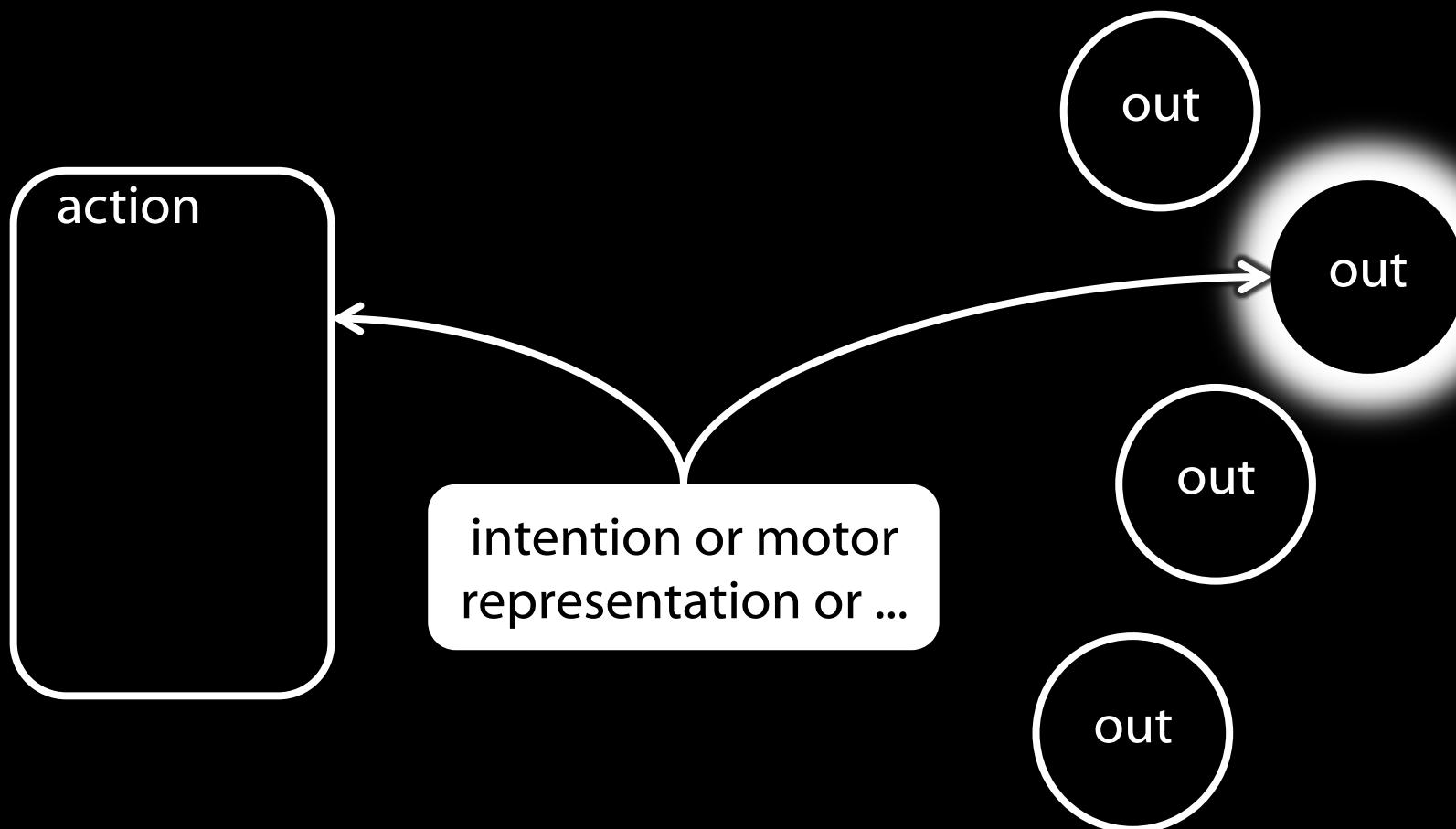
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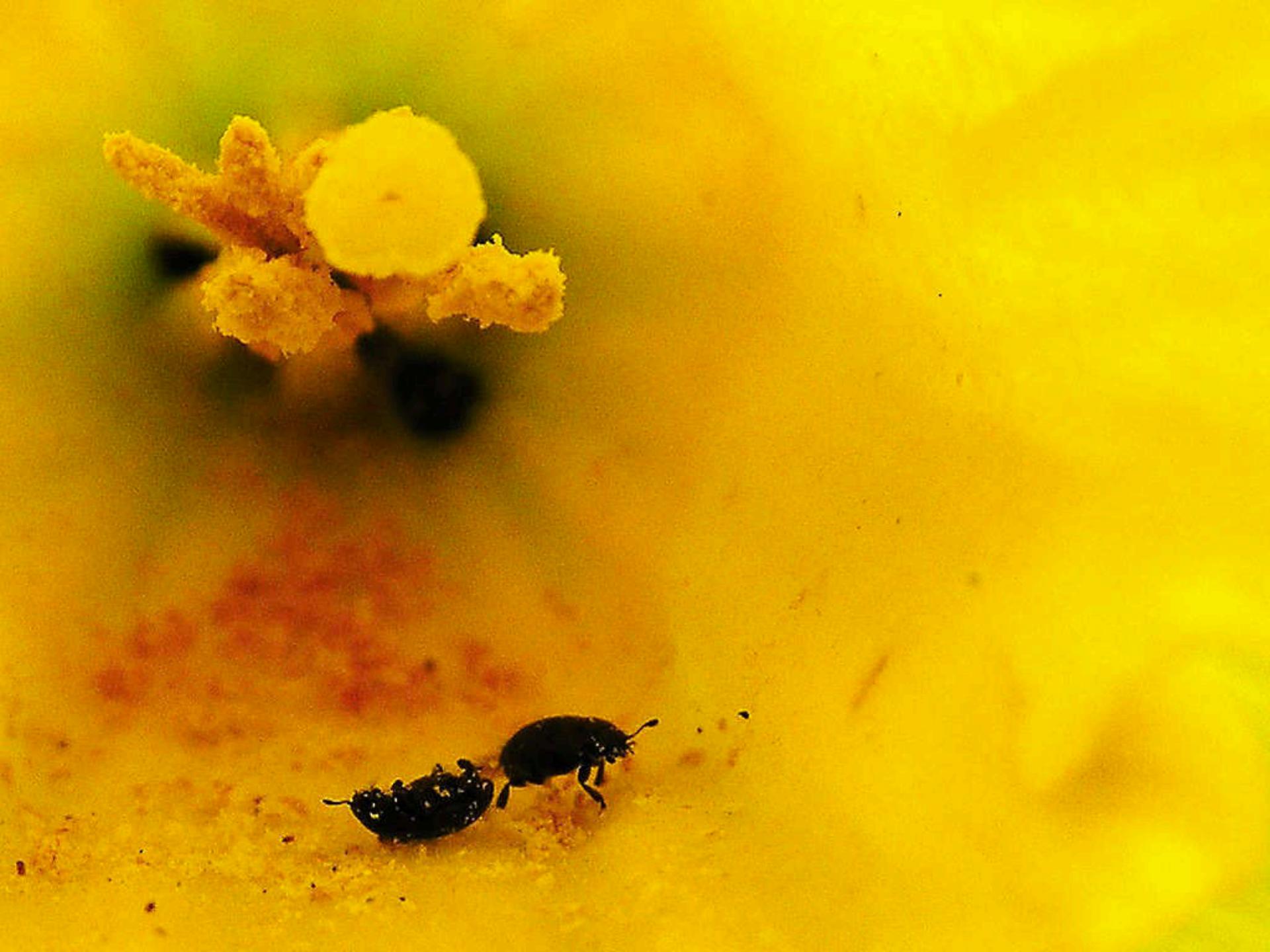


No motor representations are propositional attitudes.

No motor representations are intentions

What is the relation between a purposive action and the outcome or outcomes to which it is directed?





# The Interface Problem

# The Interface Problem

Some actions involve both  
intention and motor  
representation

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motor representations:

- i. represent outcomes;
- ii. ground the purposiveness of some actions

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- i. represent outcomes;
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Two outcomes, A and B, *match* in a particular context just if, in that context, either the occurrence of A would normally constitute or cause, at least partially, the occurrence of B or vice versa.

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## The Interface Problem: How are non-accidental matches possible?

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- i. represent outcomes;
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- iii. differ in format from intentions.

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Some actions involve both intention and motor representation

Head southeast on Rue  
Cujas toward Rue  
Victor Cousin. Turn  
right onto Rue Saint-  
Jacques. ...

==



?

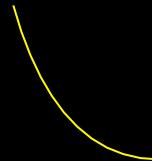
*Follow that route*

=

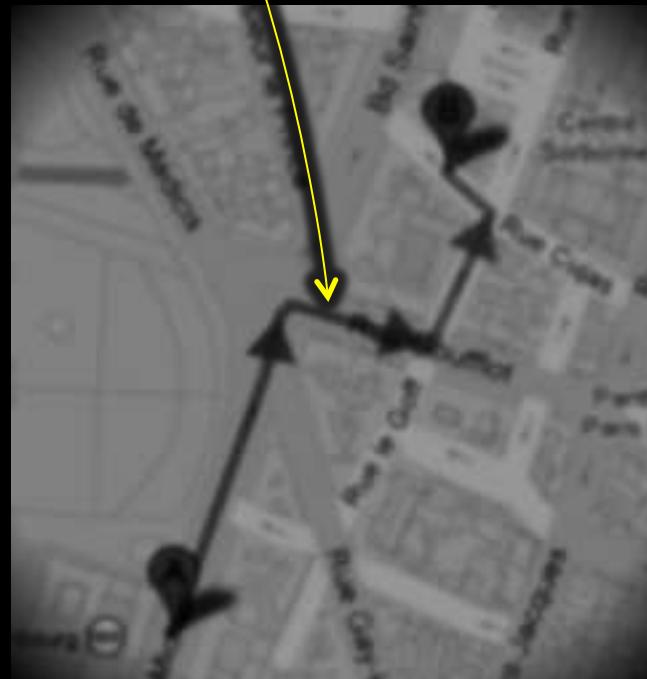


?

*Follow that route*

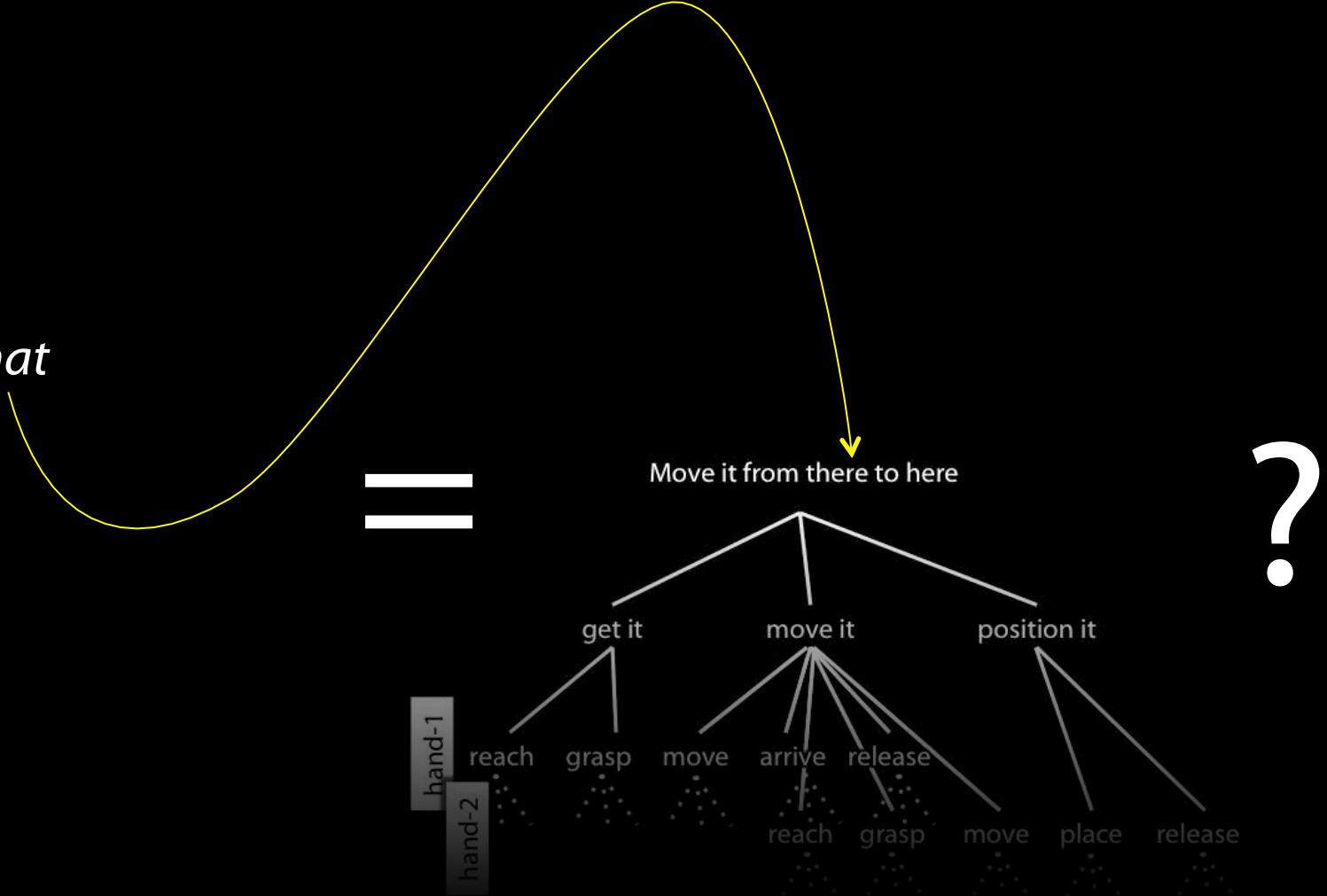


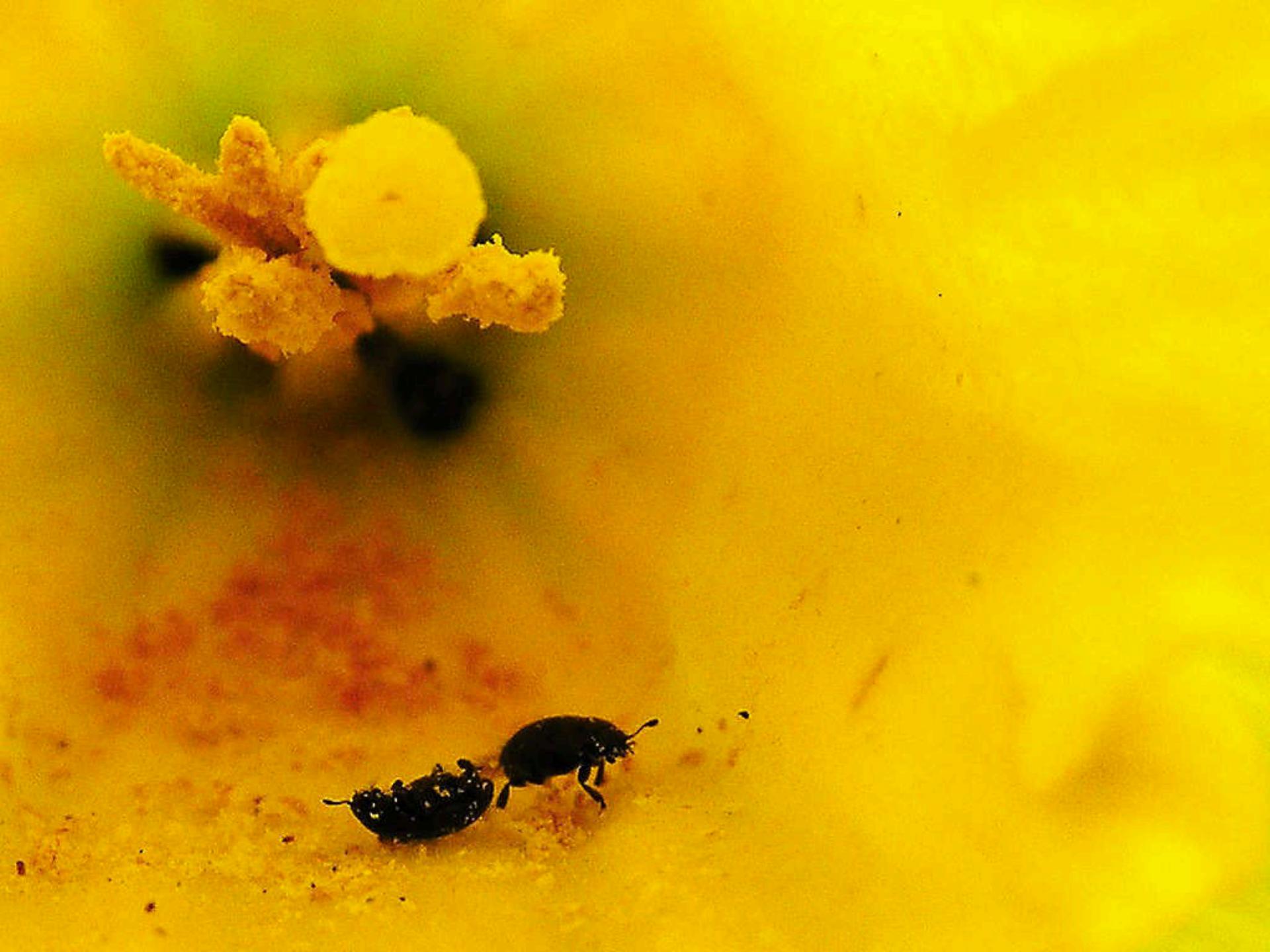
=



?

*Do that*





first round

A (10)

B (5)

second round

C (10)

D (5)

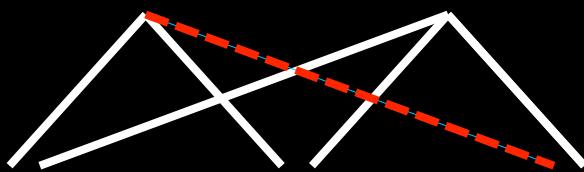
E (55)

first round



A (10)      B (5)

second round

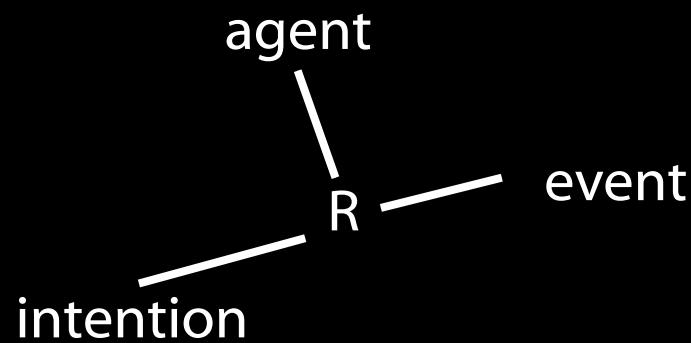


C (10)      D (5)      E (55)

“What events in the life of a person reveal agency;  
what are his deeds and his doings in contrast to  
mere happenings in his history;  
what is the mark that distinguishes his actions?”



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“a person is the agent of an event if and only if  
there is a description of what he did that makes  
true a sentence that says he did it intentionally”

(Davidson 1971:46)



first round

A (10)

B (5)

second round

C (10)

D (5)

E (55)

F (5)

## One night in Budapest

- [A] My having dinner at \_\_\_ would be desirable.
- [B] My visiting the theatre would be desirable.
- [C] My shopping at \_\_\_ would be desirable.

One night in Budapest

- [A] My having dinner at \_\_\_ would be desirable.
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- [C] My shopping at \_\_\_ would be desirable.

Alternative frame

- [A] & [B]
- [A] & [C]
- [B] & [C]