



# Discovering Affordances and Relating them to Simple Concepts in Robots

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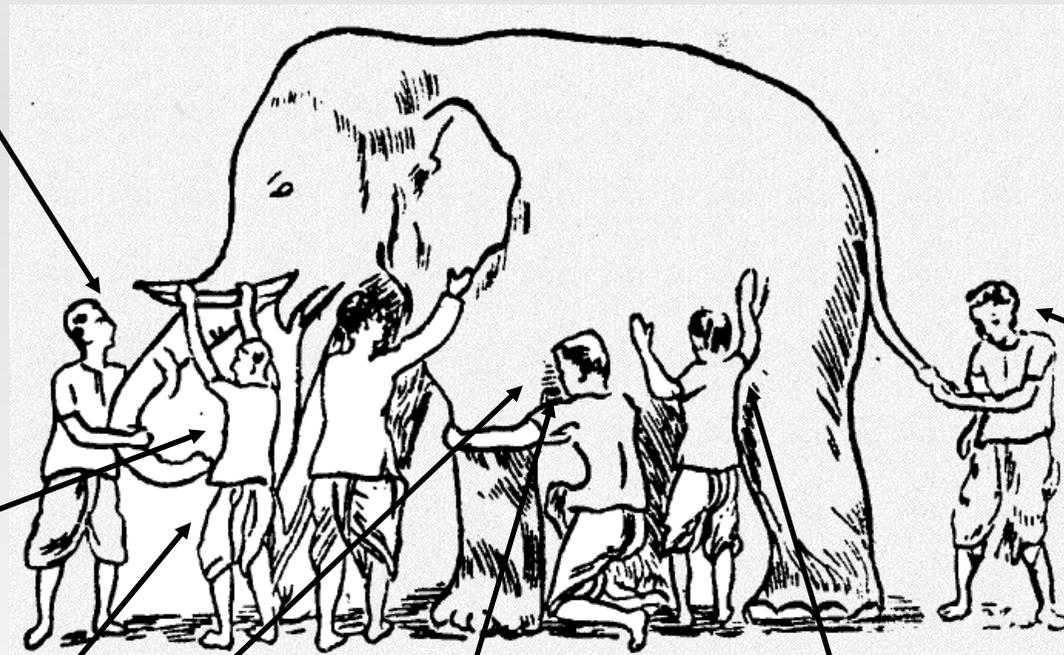
<http://kovan.ceng.metu.edu.tr/~erol/>





# An Elephant called Affordance

J.J.Gibson



MacDorman

Amand &  
Steedman

Fitzpatrick &  
Stoytchev

Rizzolatti

E.Gibson

Turvey,  
Chemero,  
Stoffregen

Norman &  
Murphy

The concept has been mostly used as a source of inspiration and studied in within specific topics.

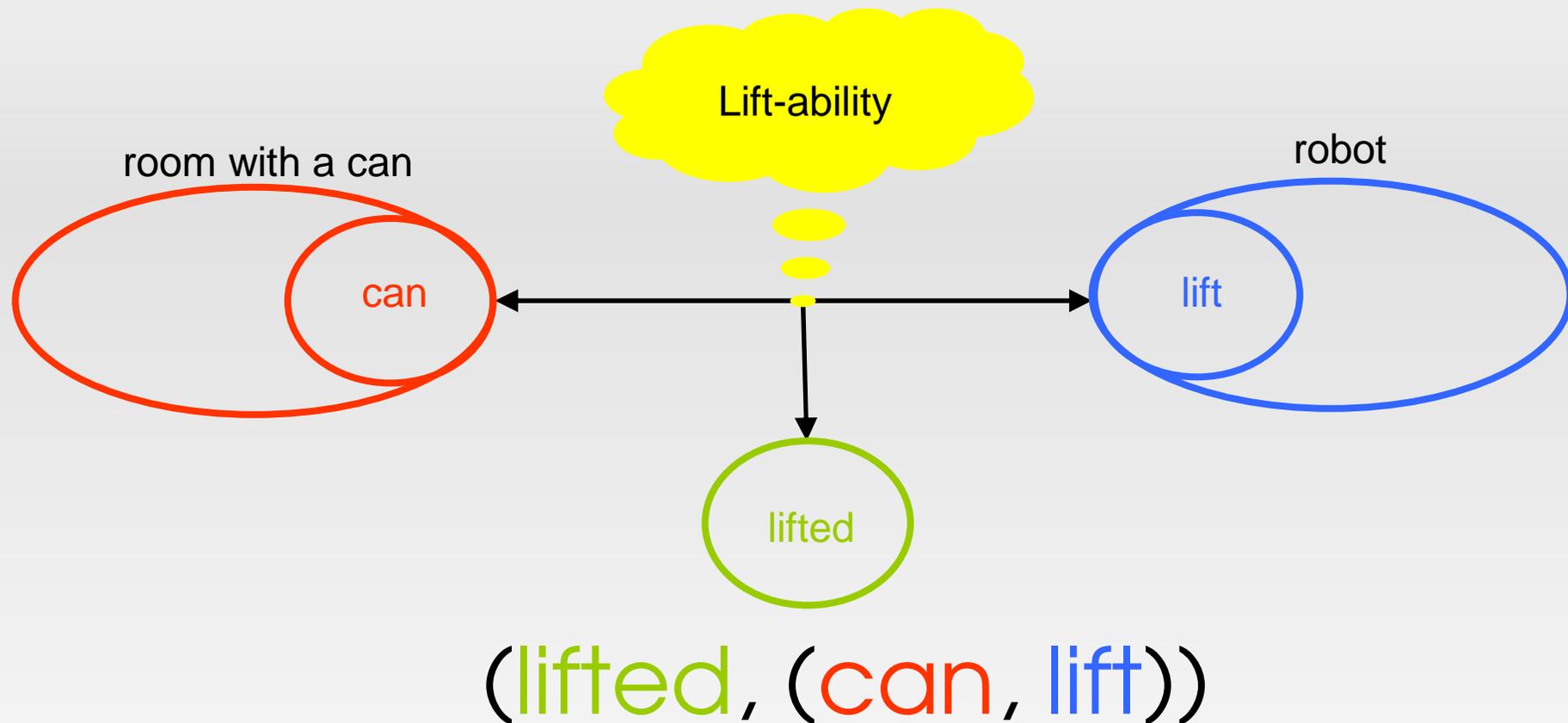


# What do affordances provide?

- Affordances are relative
  - To the agent acting in the environment
- Affordances provide perceptual economy
  - Minimal and direct perception
- Affordances are general
  - Ability to perceive affordances in unseen environments
- Affordances are directly linked with action
  - When I see a cup, I perceive its affordances



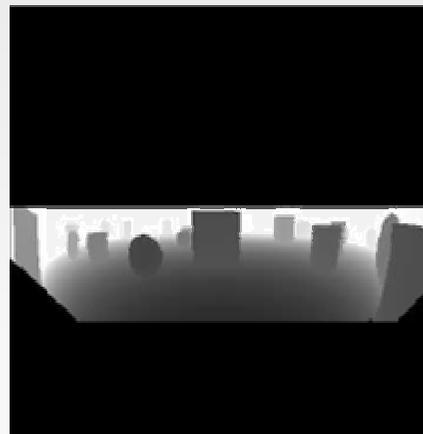
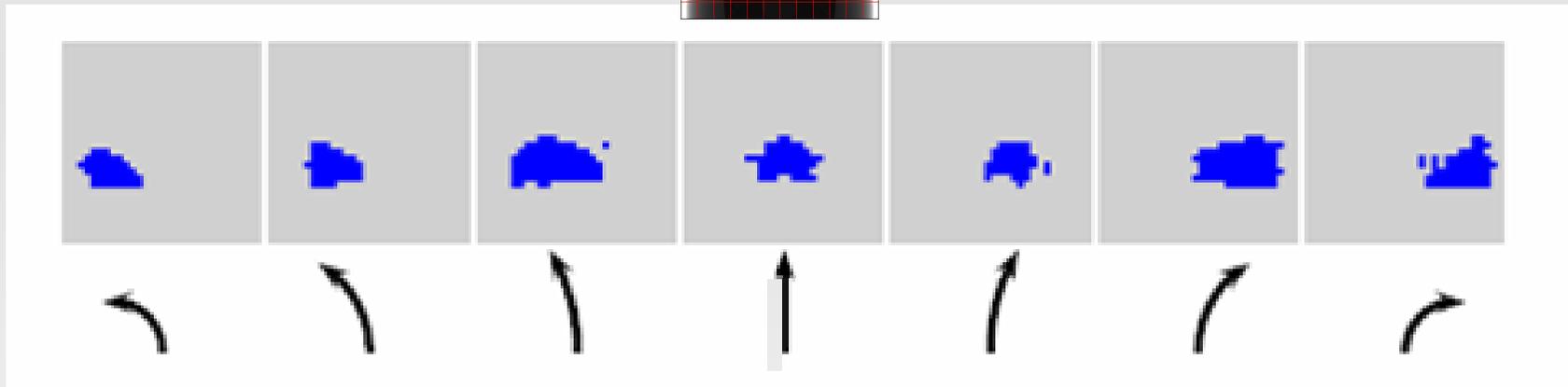
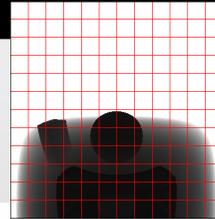
# Affordance as a relation



Sahin E., Cakmak M., Dogar M.R., Ugur E. and Ucoluk G. (2007).  
To afford or not to afford: A new formalization of affordances  
towards affordance-based robot control.  
Adaptive Behavior, vol 15, 4, pages 447-472.



# Perceptual Economy



Ugur E., Dogar M.R., Cakmak M. and Sahin E. (2007) .  
[The learning and use of traversability affordance using range images on a mobile robot](#),  
In Proc. of ICRA'07, pp. 1721-1726

Only 1% of the features are relevant!



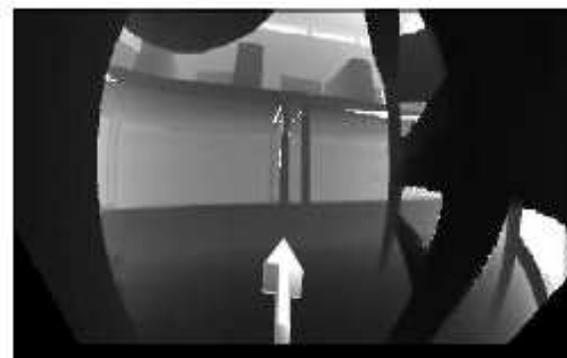
# Detection of traversability



(a)



(b)



(c)



(d)



(e)



(f)

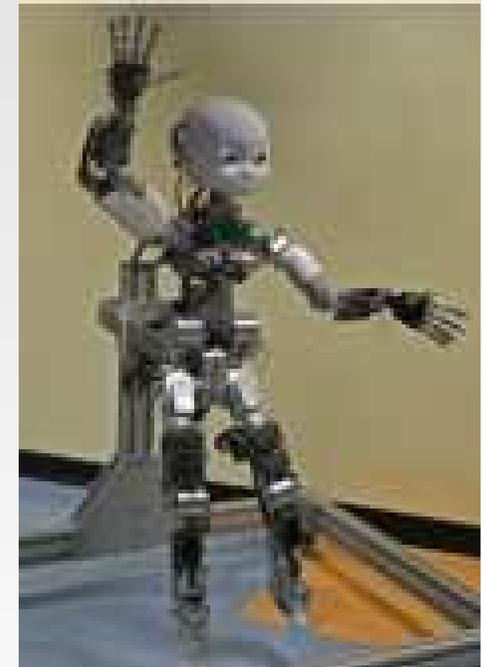
# ROSSI Project



h Lab



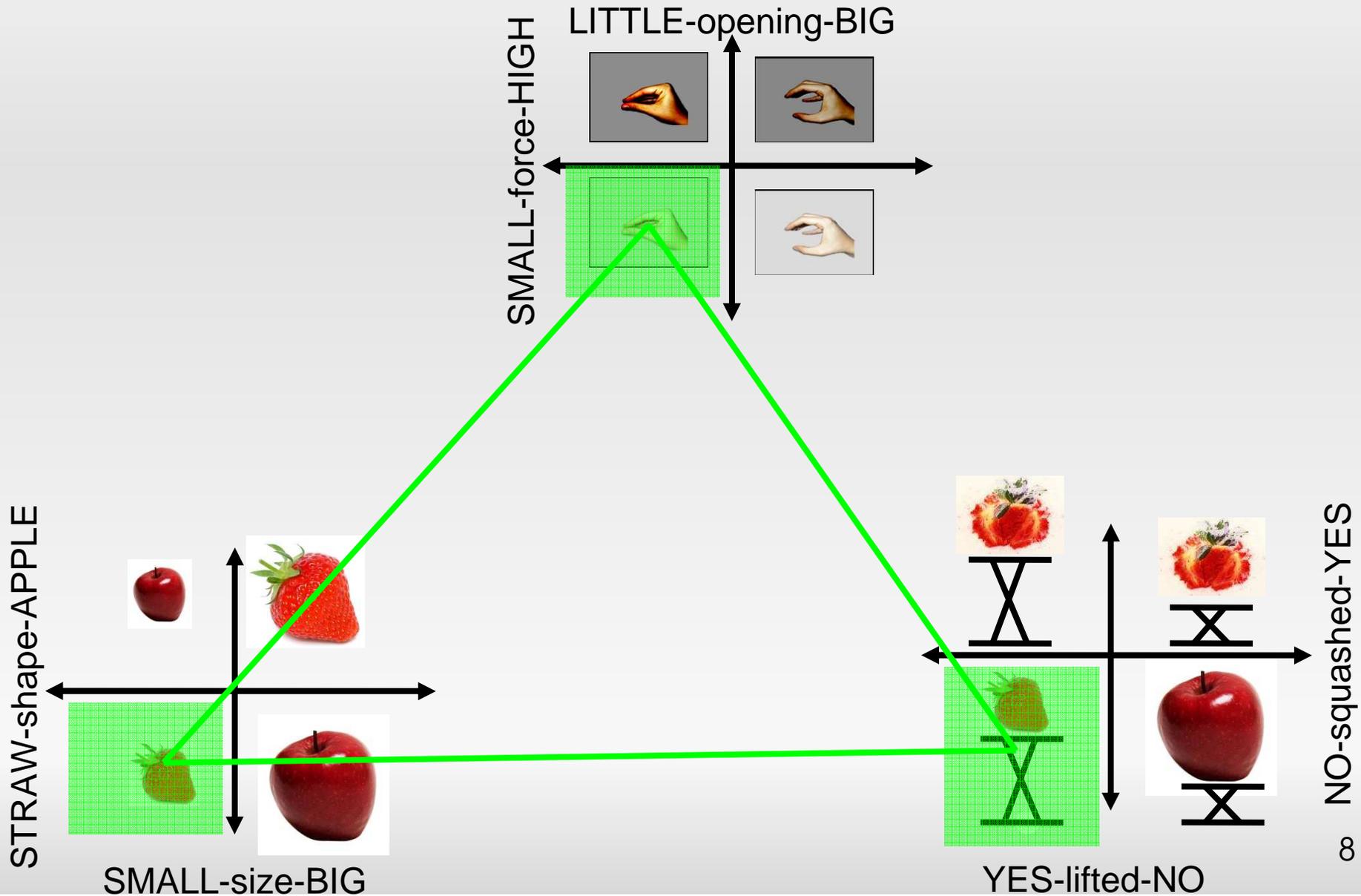
- How robots endowed with the features of mirror and canonical neurons can understand and produce verbal labels that co-vary with objects and actions, in order to facilitate communication between robots and humans?
  - Develop a neurocomputational model that combines
    - Mirror and canonical neurons
    - Affordances
    - Language (nouns and verbs)
  - and implement it on iCub.



# Affordances as relations



h Lab



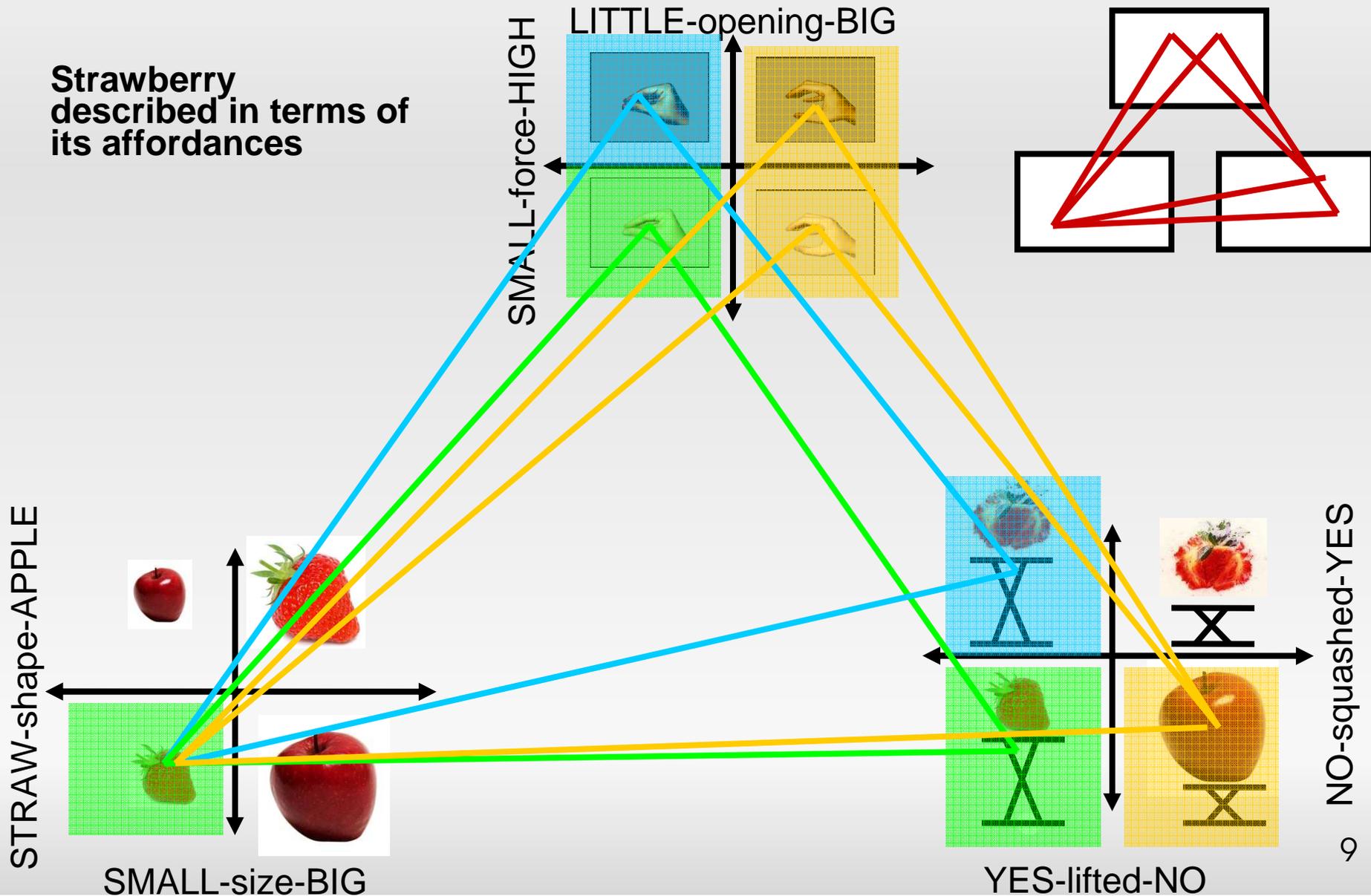
# The concept of a strawberry



h Lab



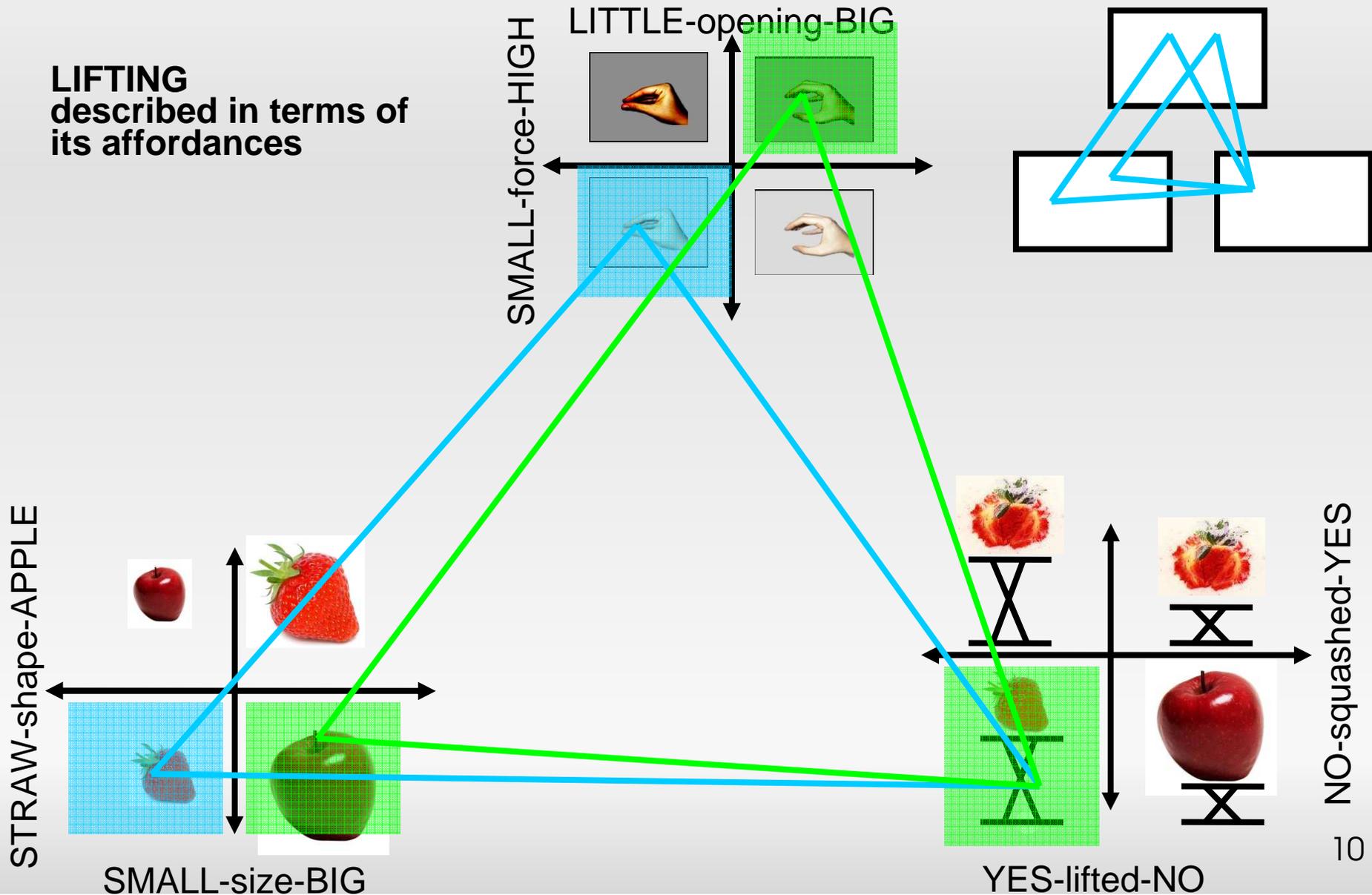
Strawberry described in terms of its affordances



# The concept of lifting



**LIFTING**  
described in terms of  
its affordances





Thanks for your attention!

**More info available at:**

<http://kovan.ceng.metu.edu.tr/~erol/>

