

computational thinking is child's play:

teaching children thinking through computational toys

children  
creativity  
thinking  
tinkering  
design  
computation  
toys  
construction(ism)  
fun  
play  
making  
programming  
craft



Jeannette  
Wing

Computational thinking is a way of solving problems, designing systems, and understanding human behavior that draws on concepts fundamental to computer science. ... thinking in terms of abstractions, invariably multiple layers of abstraction at once. ... the automation of these abstractions. [CACM - 2006]

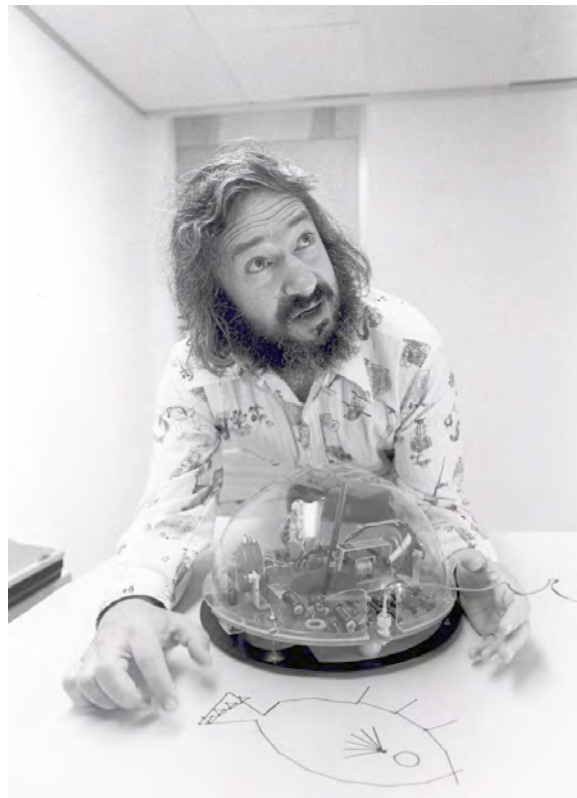
... in its embodiment as the physical computer, computation opens a vast universe of things to do. But the real magic comes when this is combined with the conceptual power of theoretical ideas associated with computation.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
A.I. LABORATORY

Artificial Intelligence  
Memo No. 247

October 1971

LOGO  
Memo No. 2



TEACHING CHILDREN THINKING<sup>1,2</sup>

Seymour Papert\*

Computation has had a profound impact by concretizing and elucidating many previously subtle concepts in psychology, linguistics, and the foundations of logic and mathematics. I shall try to show how this elucidation can be projected back to the initial teaching of these concepts.

out, forward

pro.gram

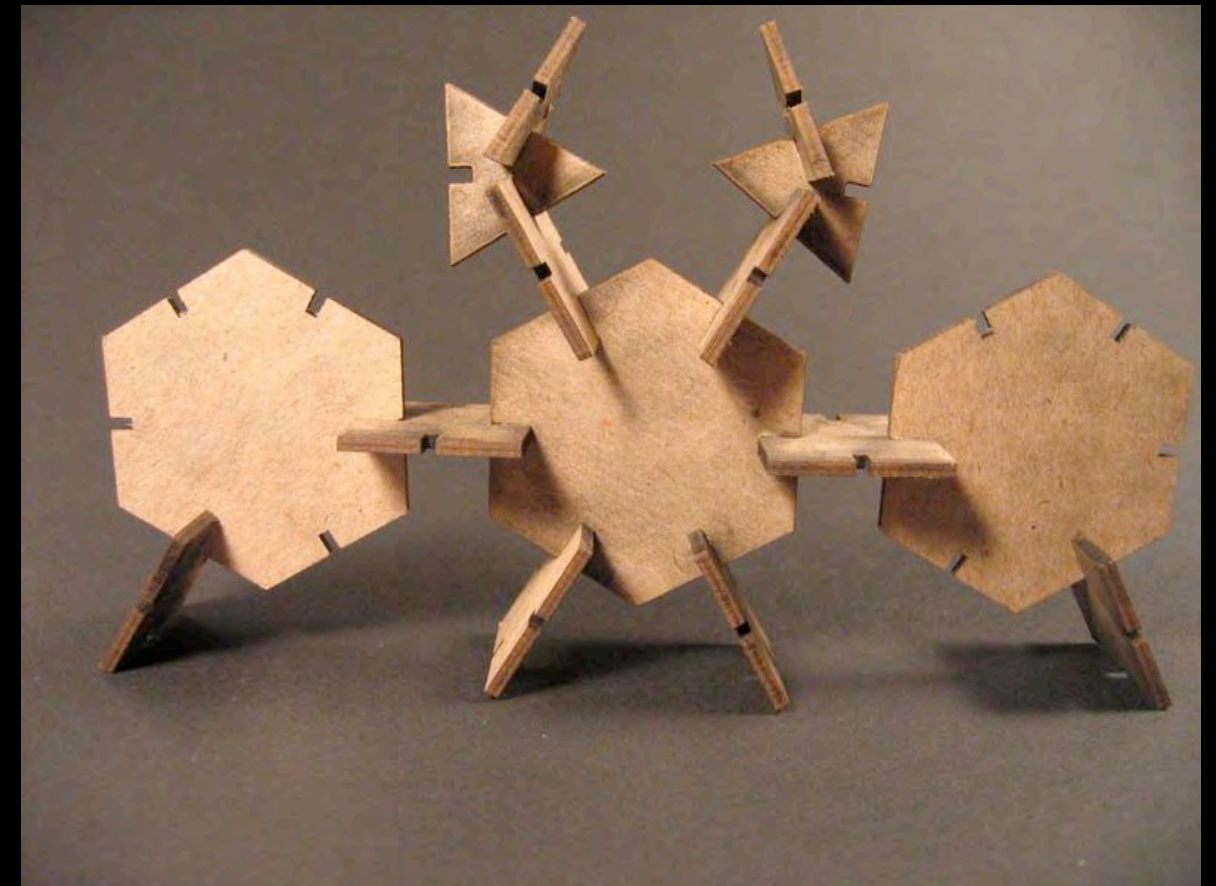
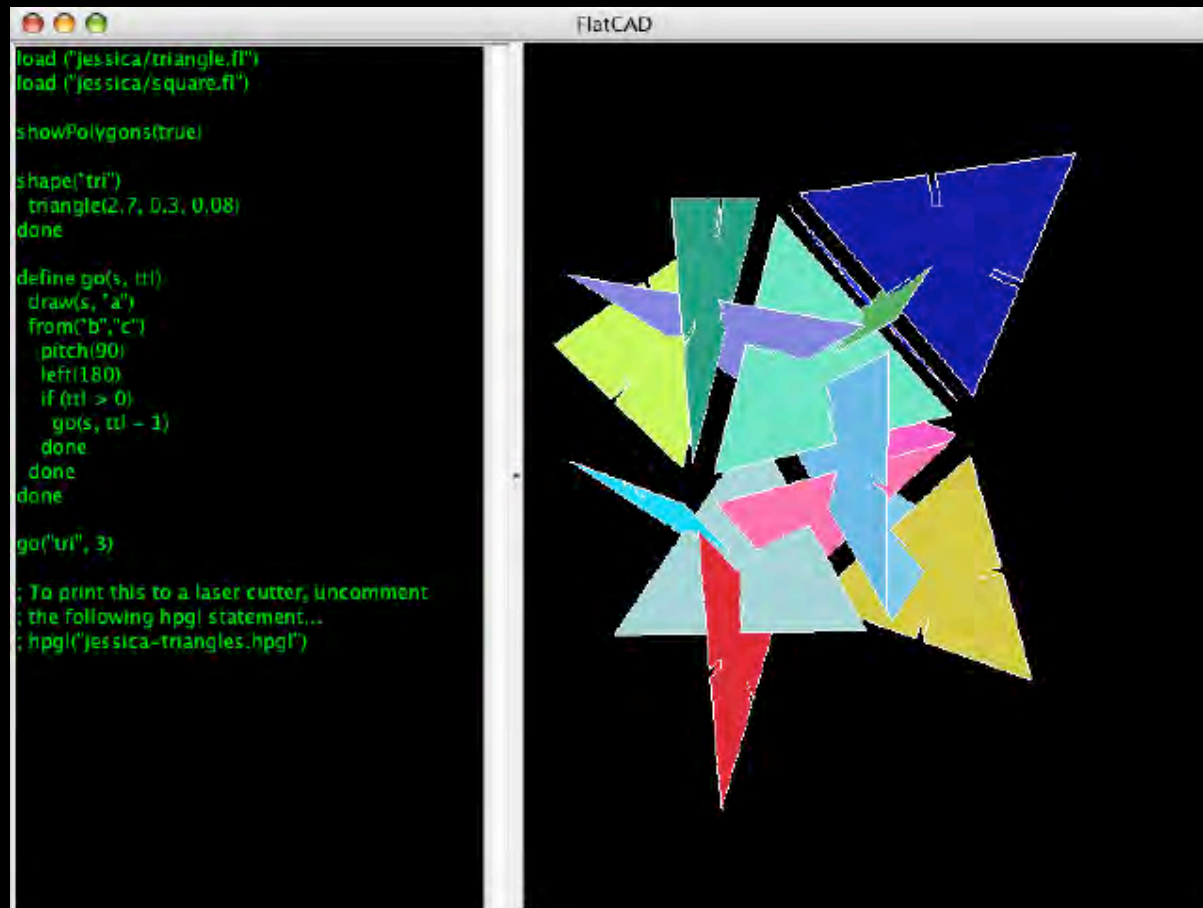
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out, off

de.sign

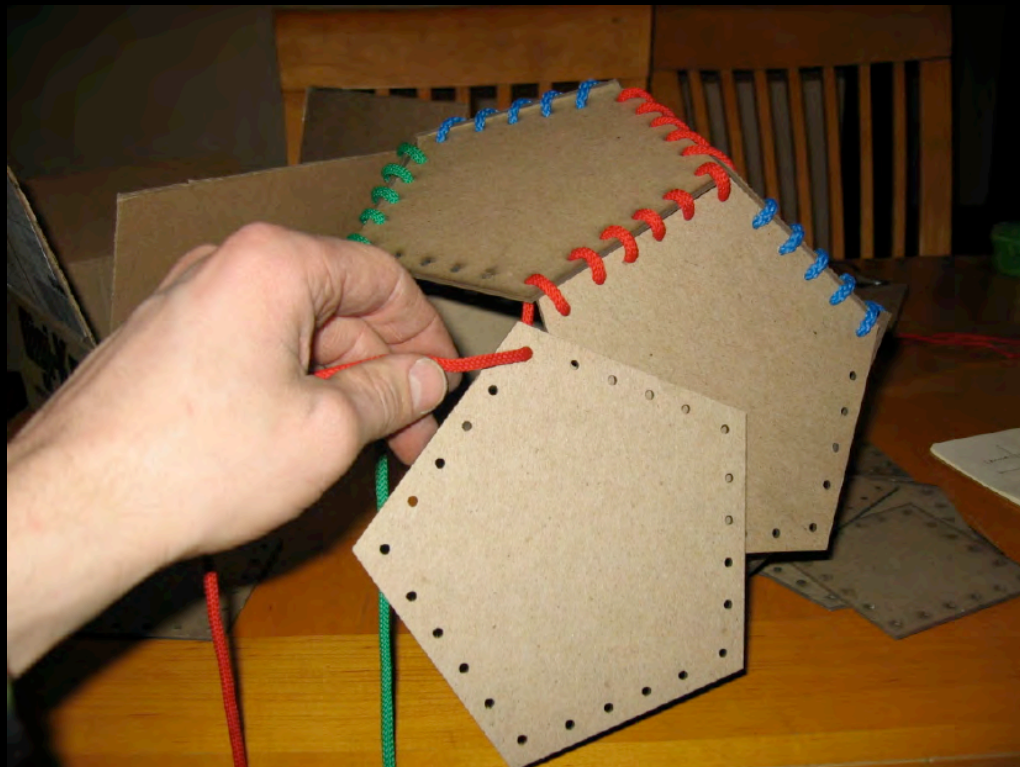
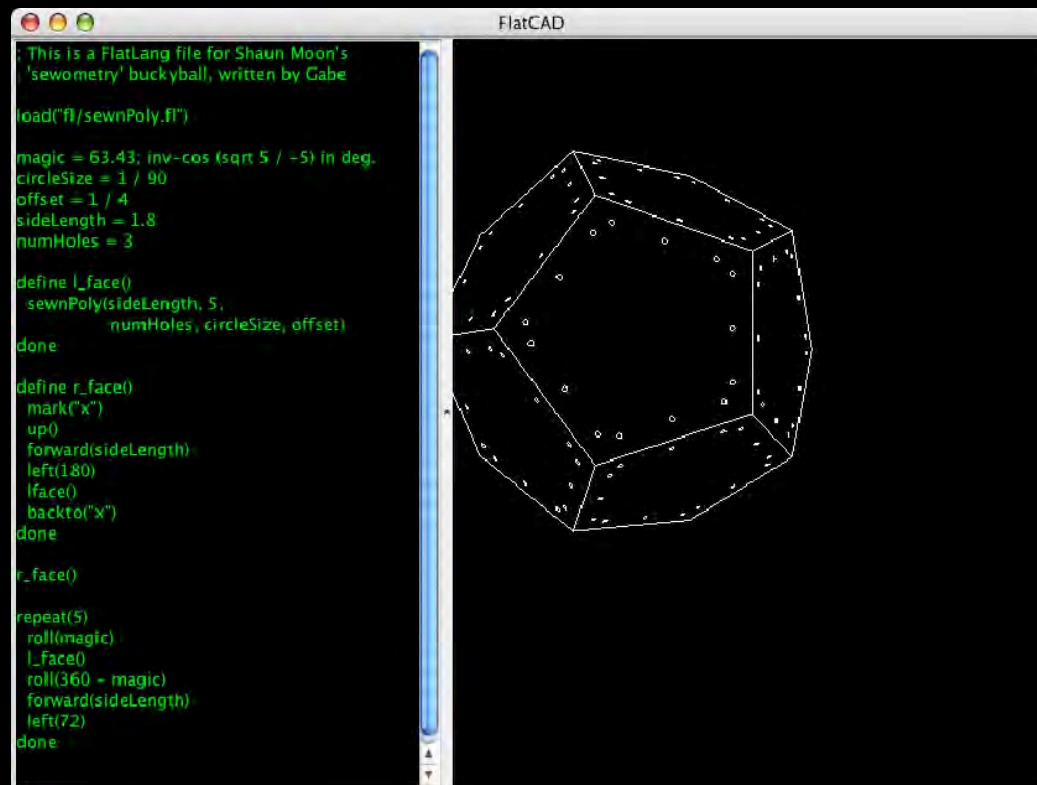
something  
written, a mark

mark



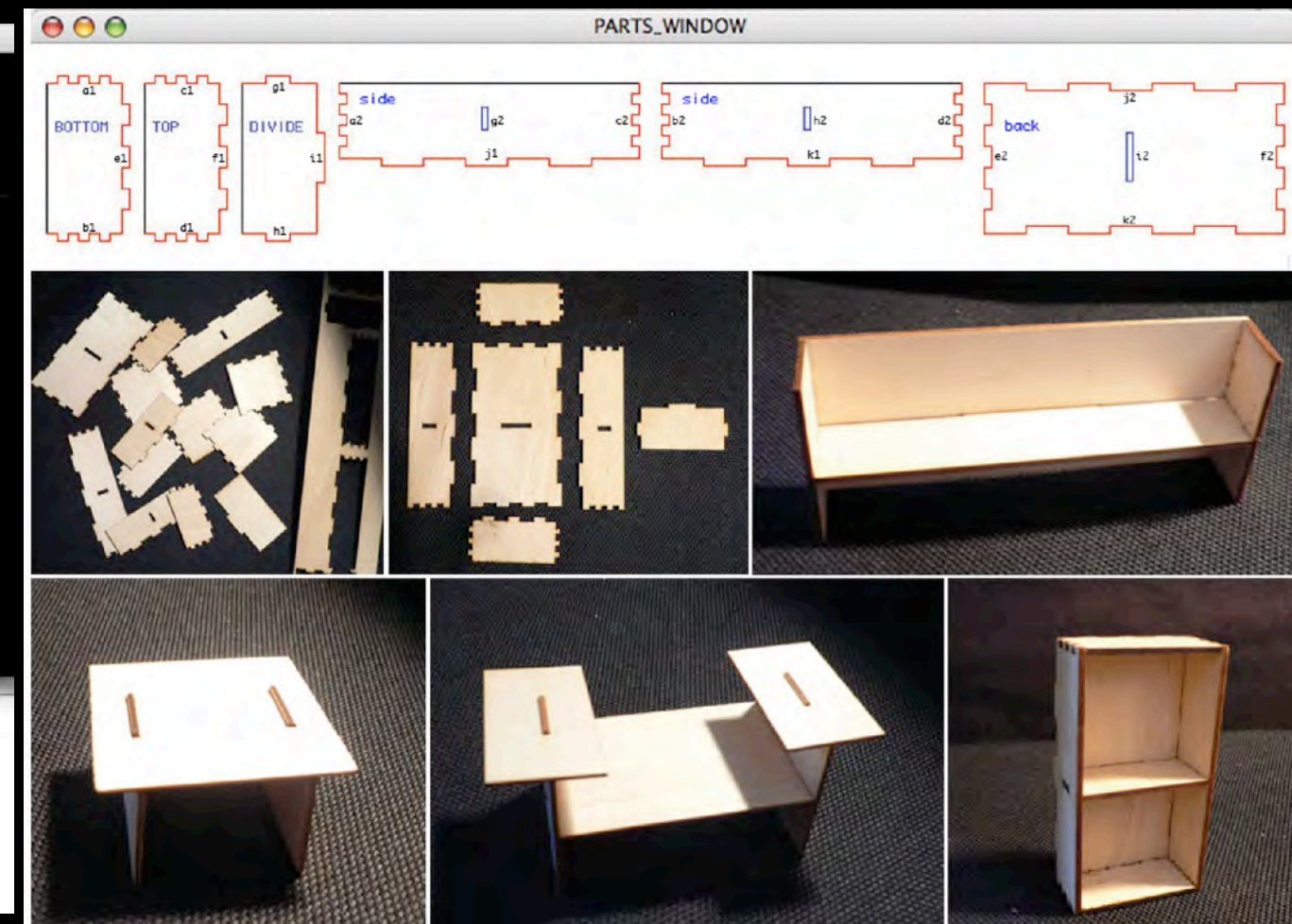
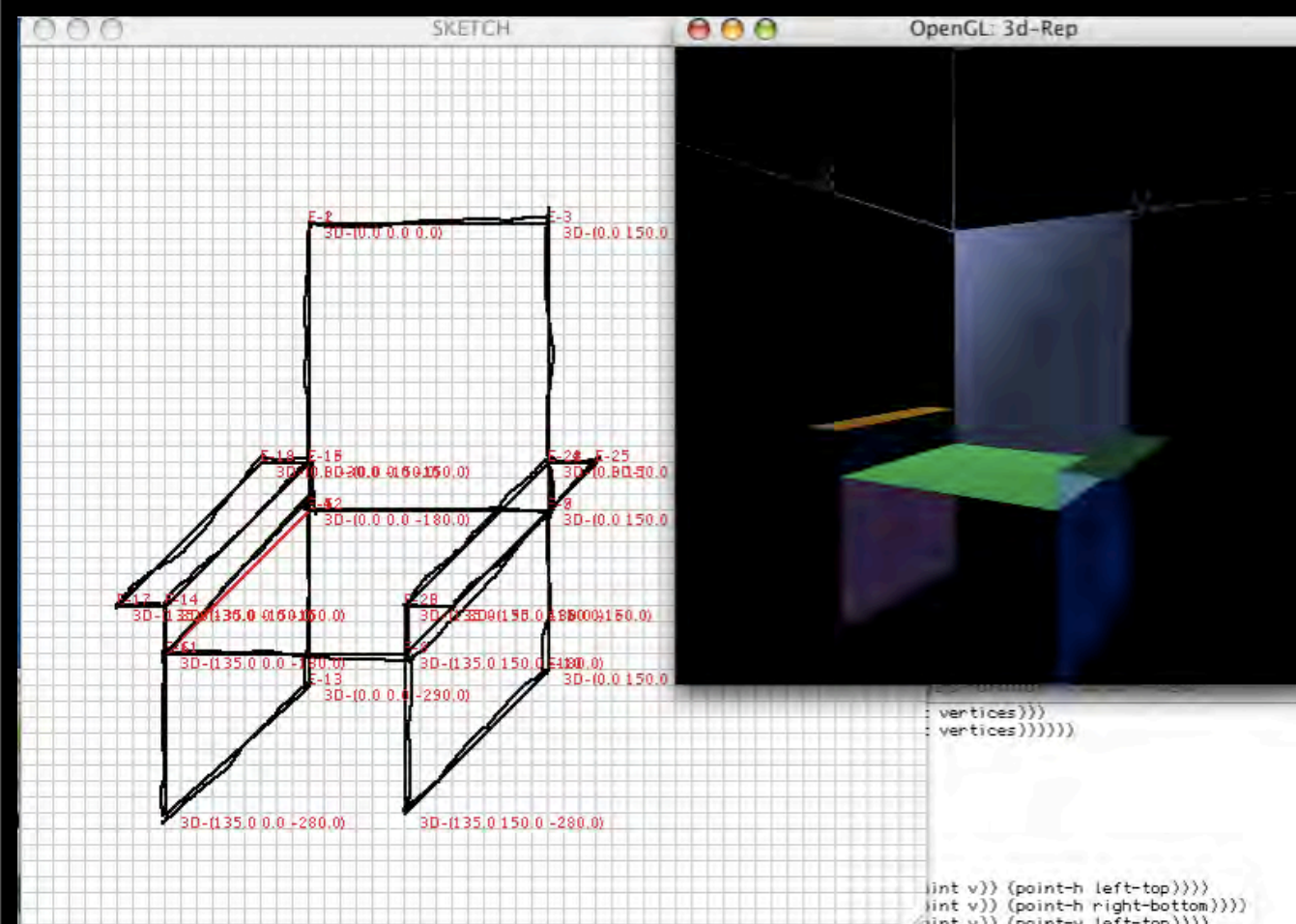
FlatCAD: using 3D turtle geometry to design and manufacture wood models





SewOmetry - using FlatCAD to make construction kits

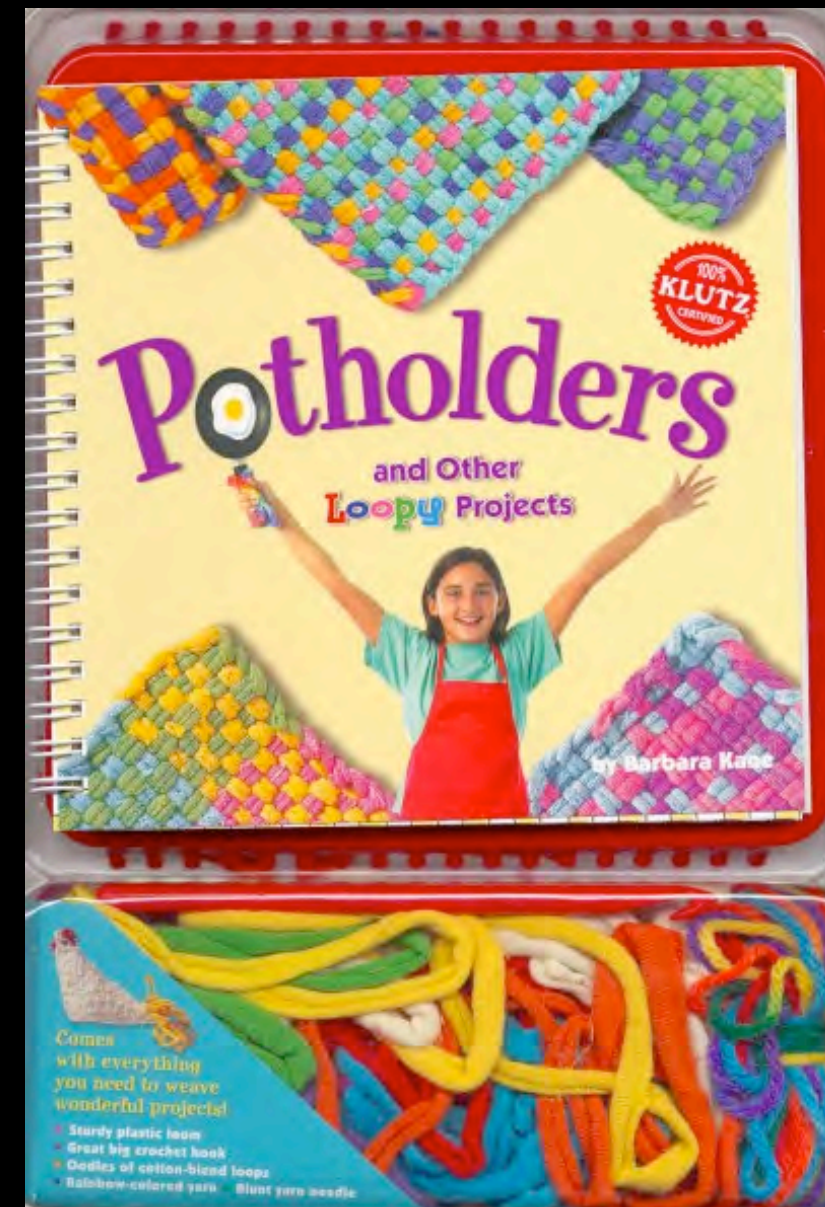
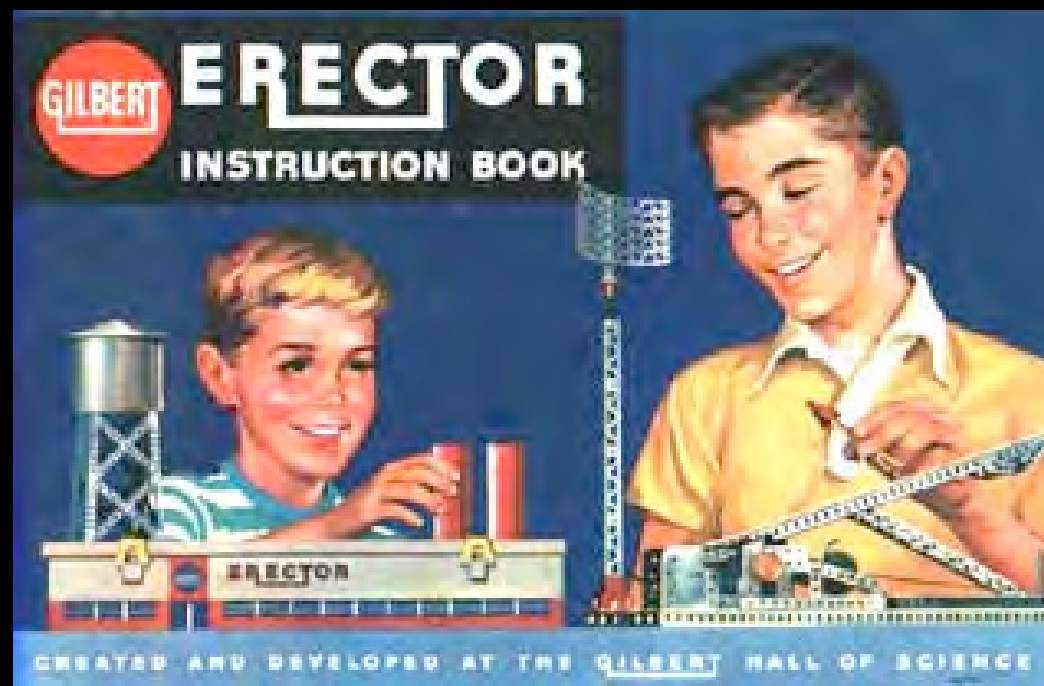




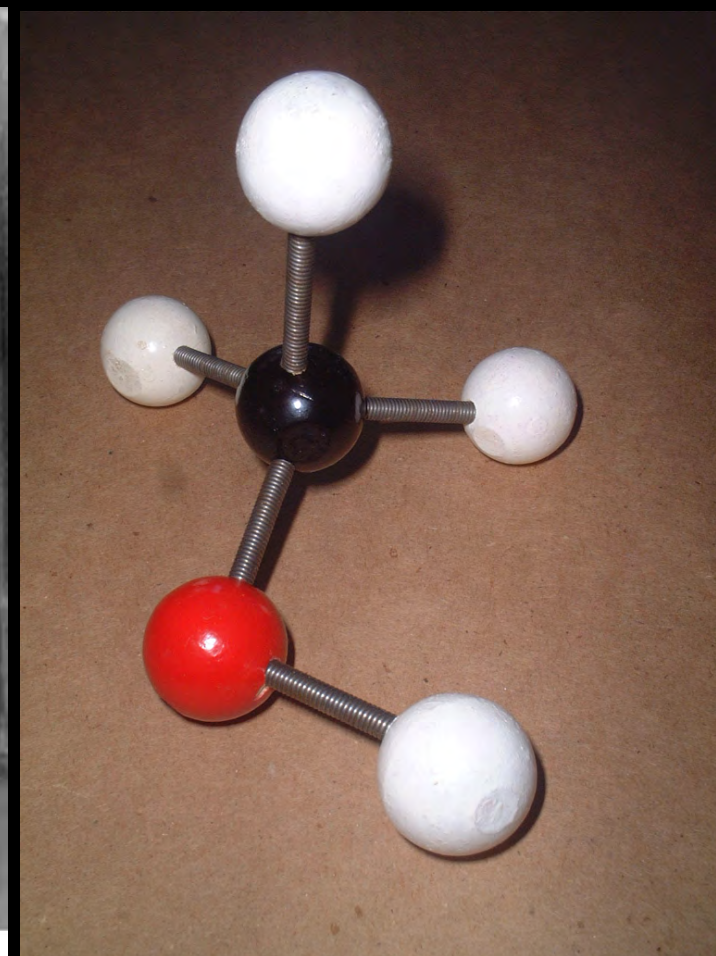
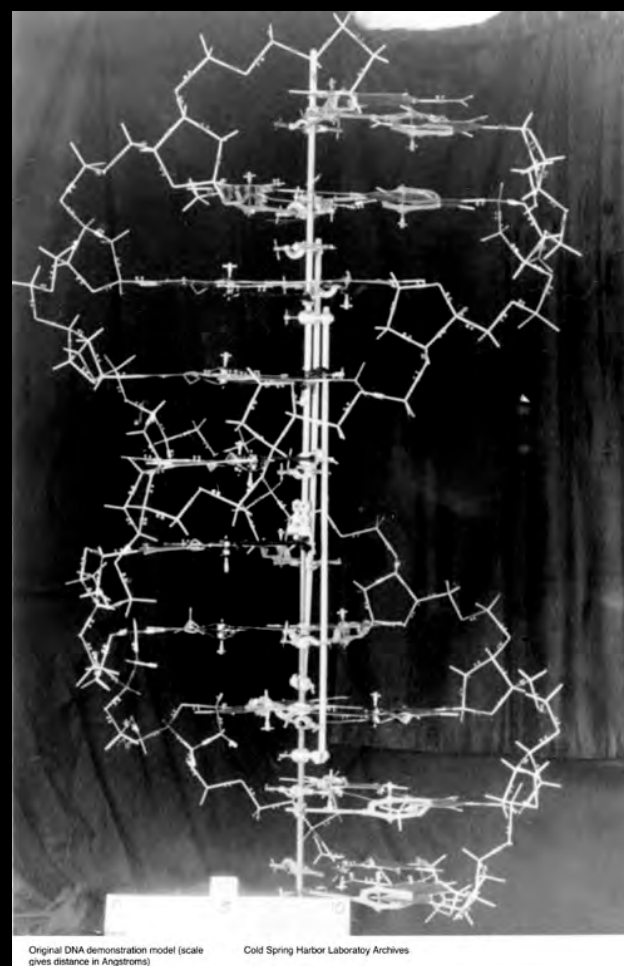
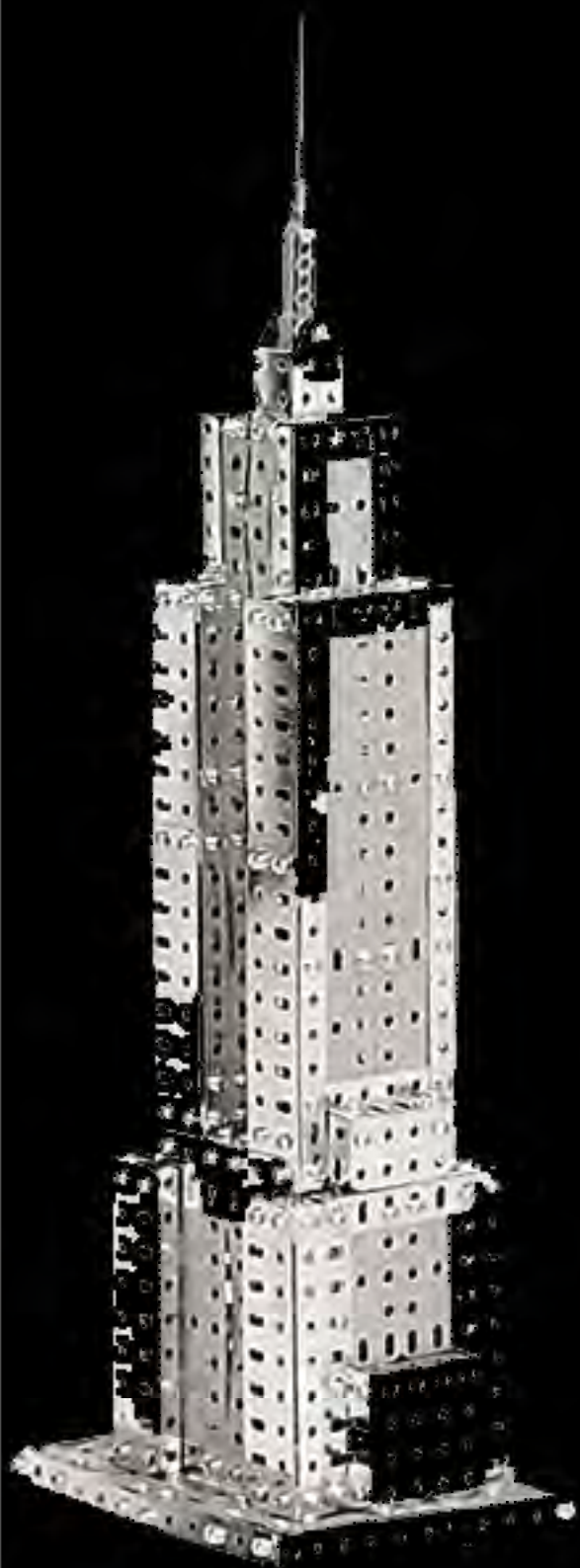
Furniture Factory - sketch to 3D for rapid manufacture



# construction kits



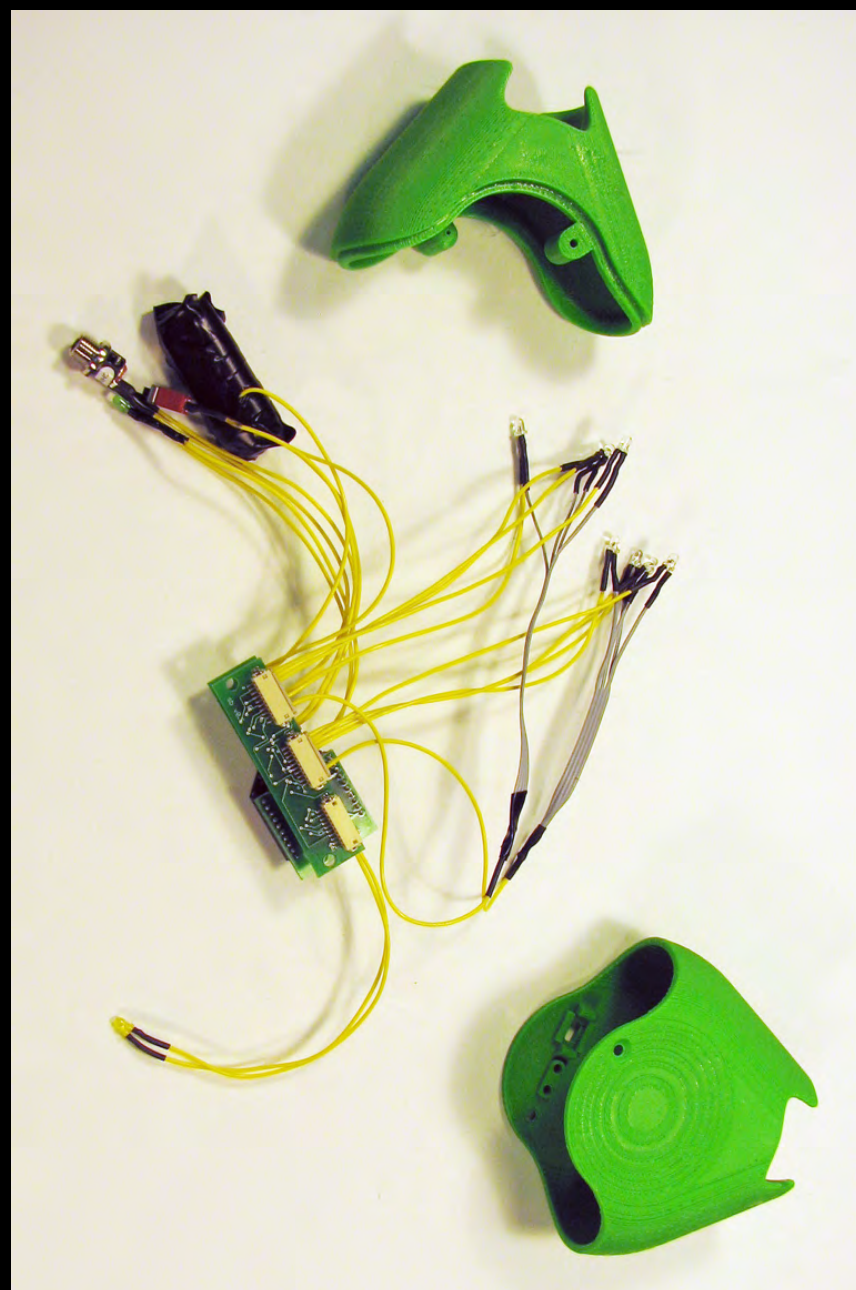
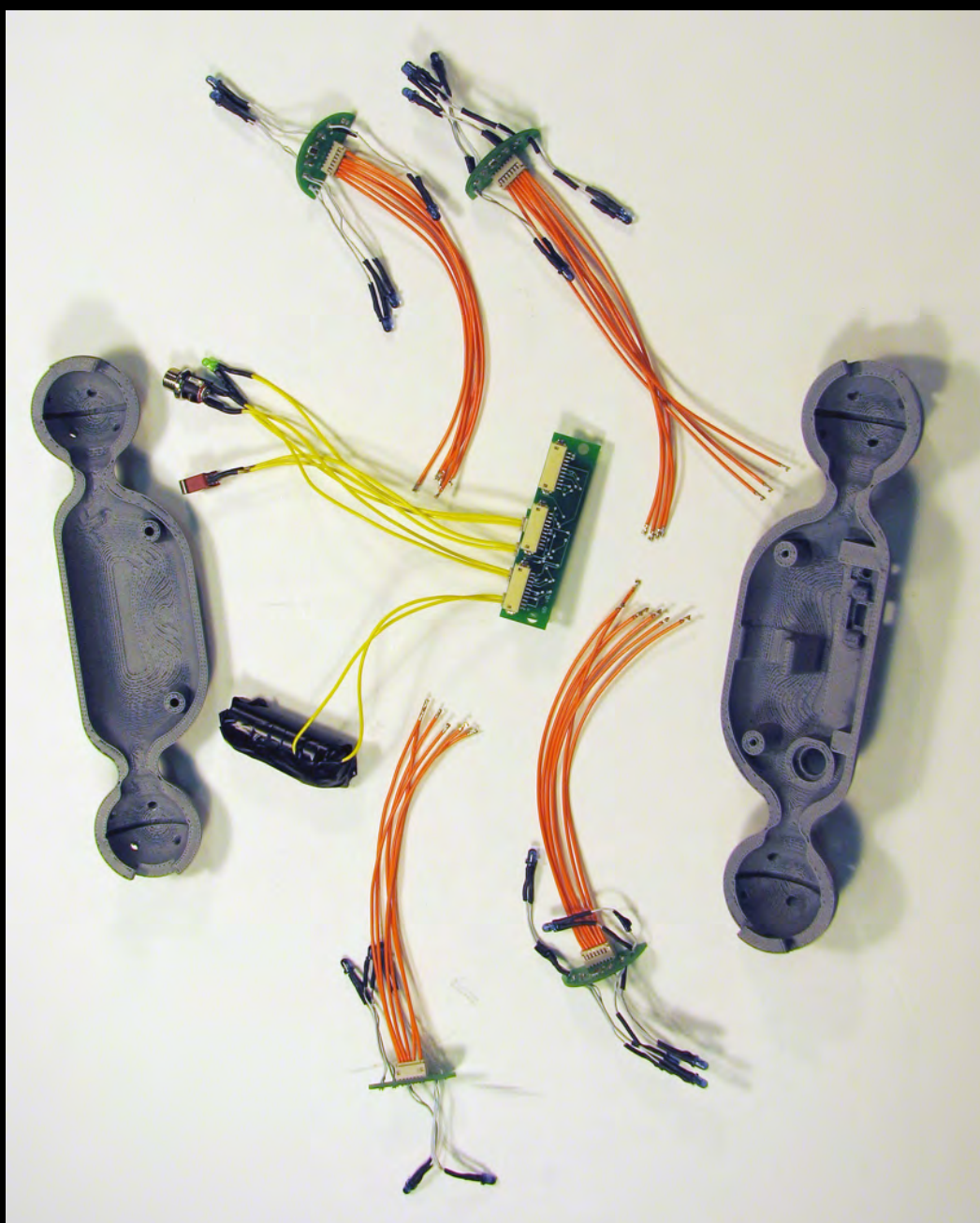




posey





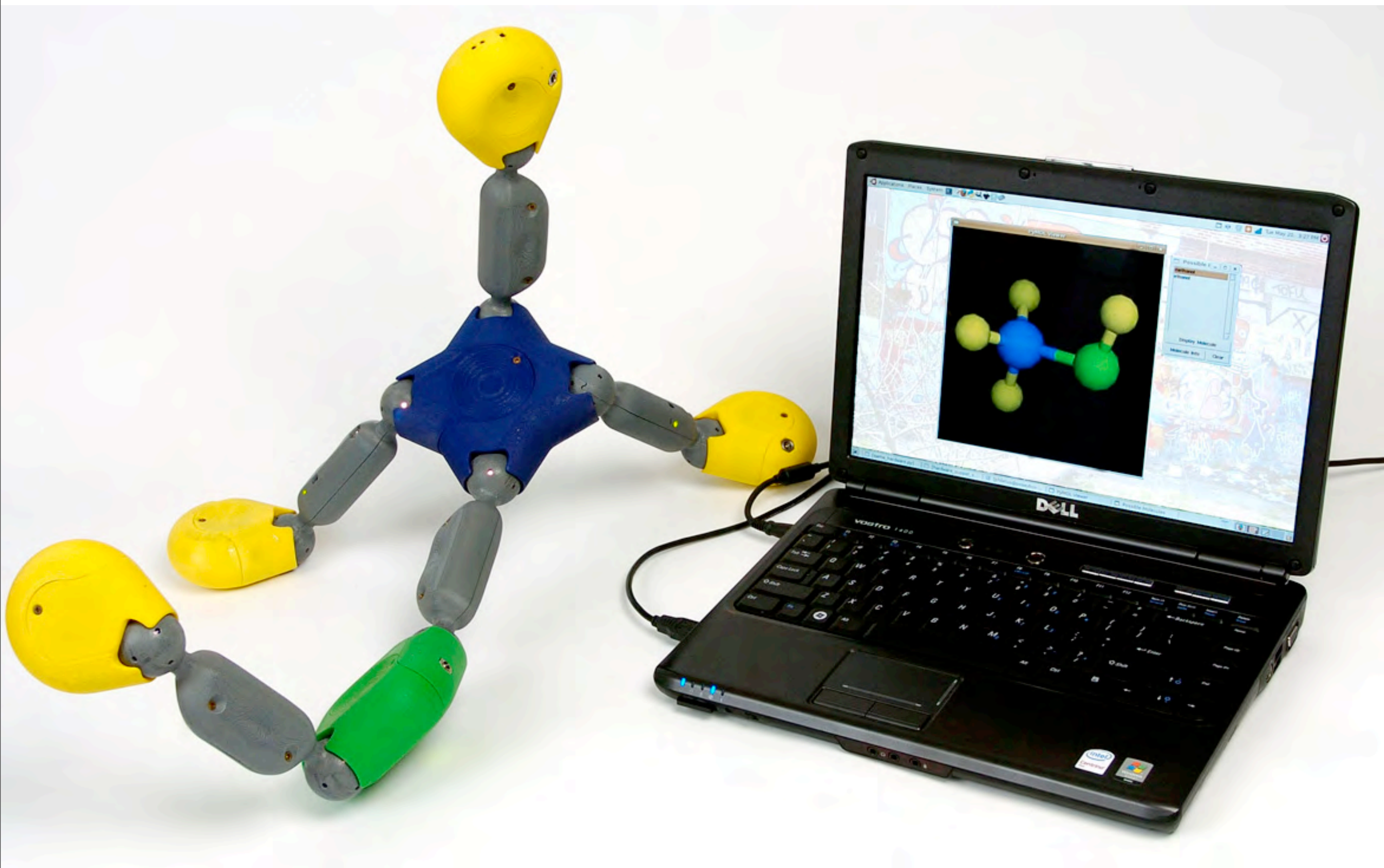






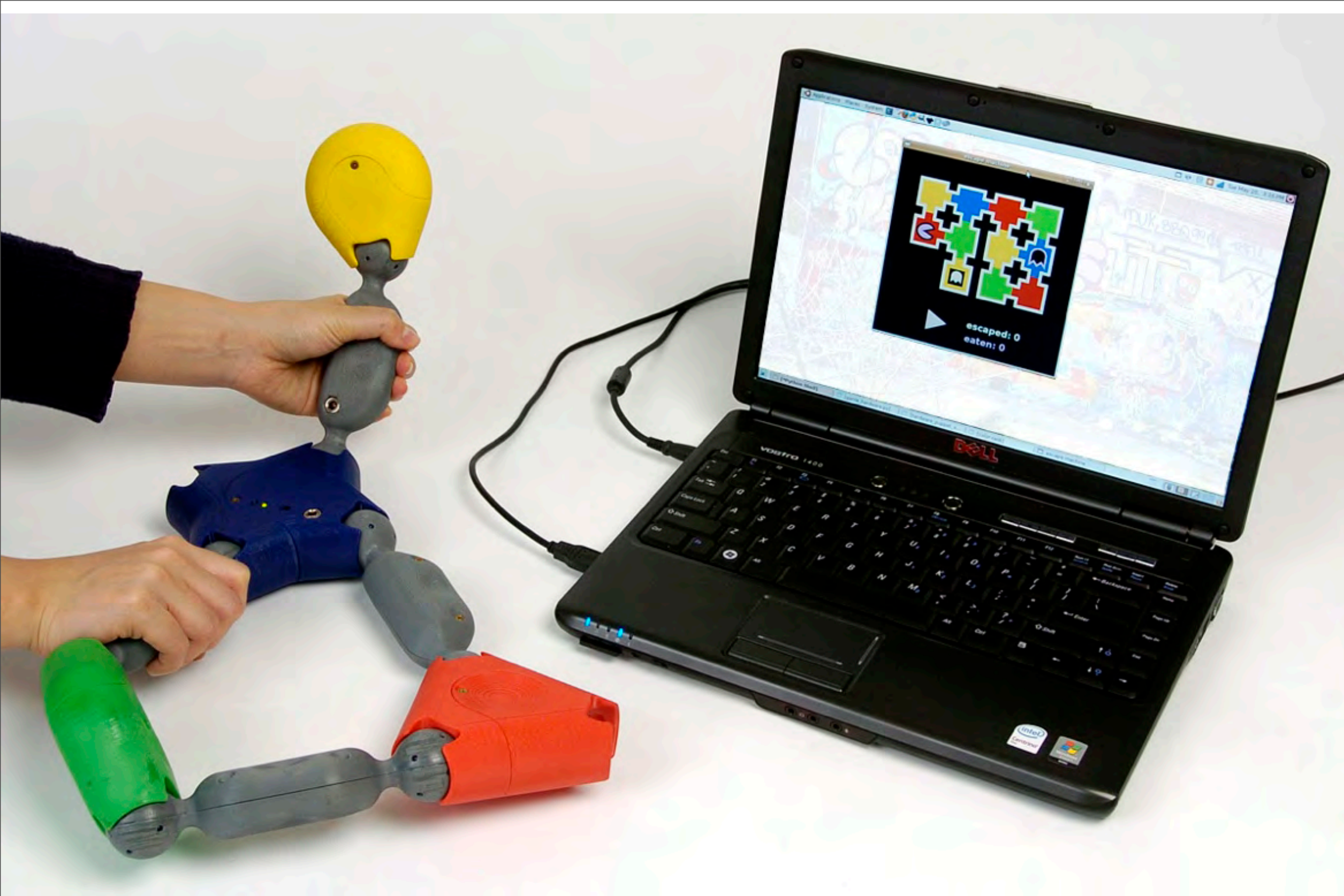
“Puppet Show”





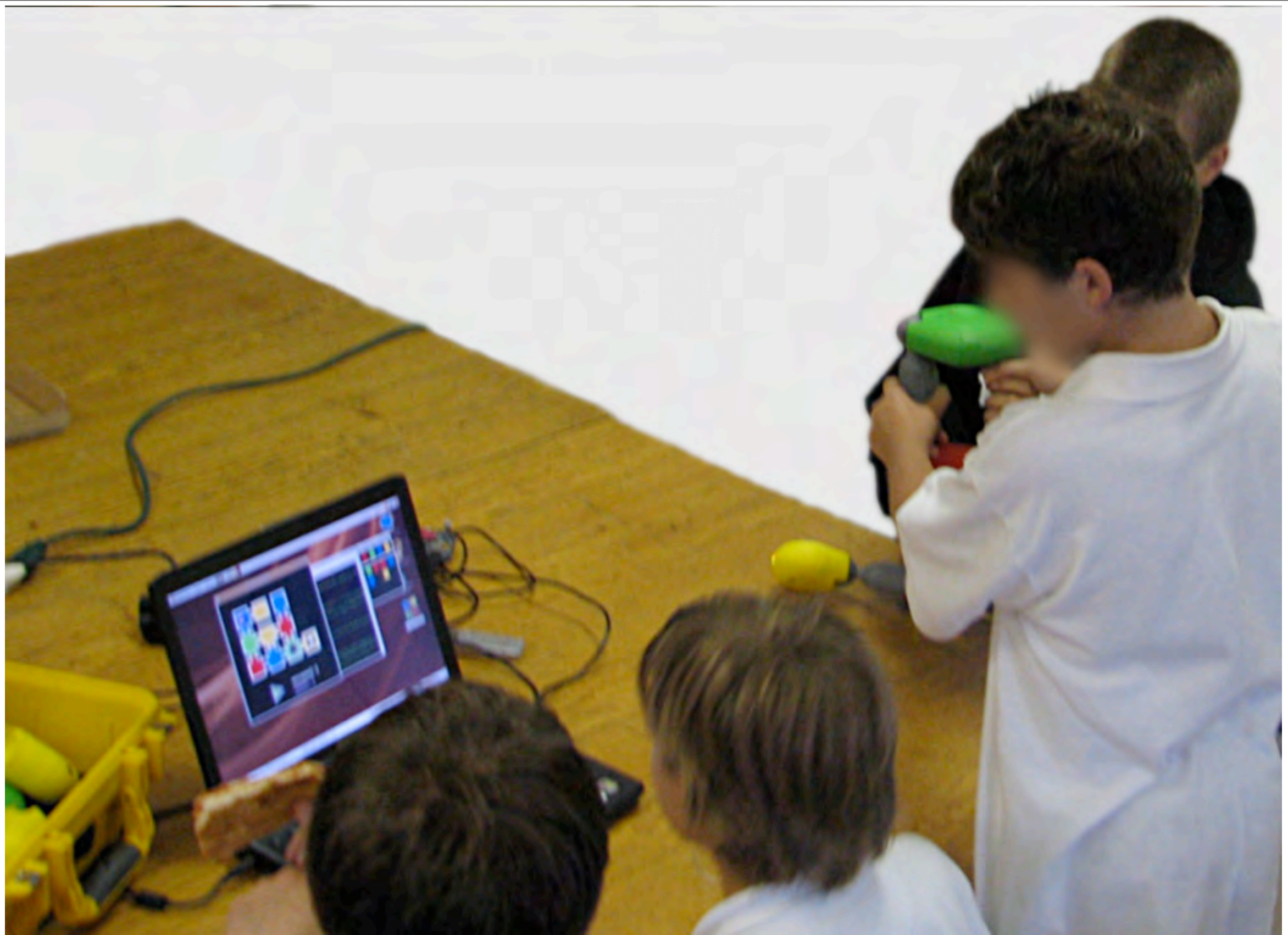
“Molecule Explorer”





“Escape Machine” - a tangible state machine game



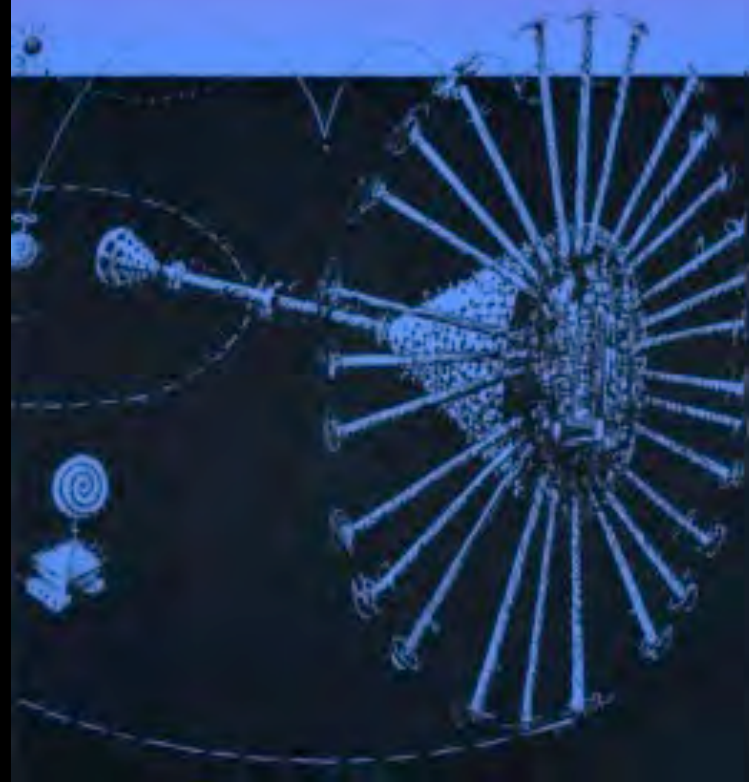


roBlocks

# VEHICLES

Experiments in Synthetic Psychology

Valentino Braitenberg



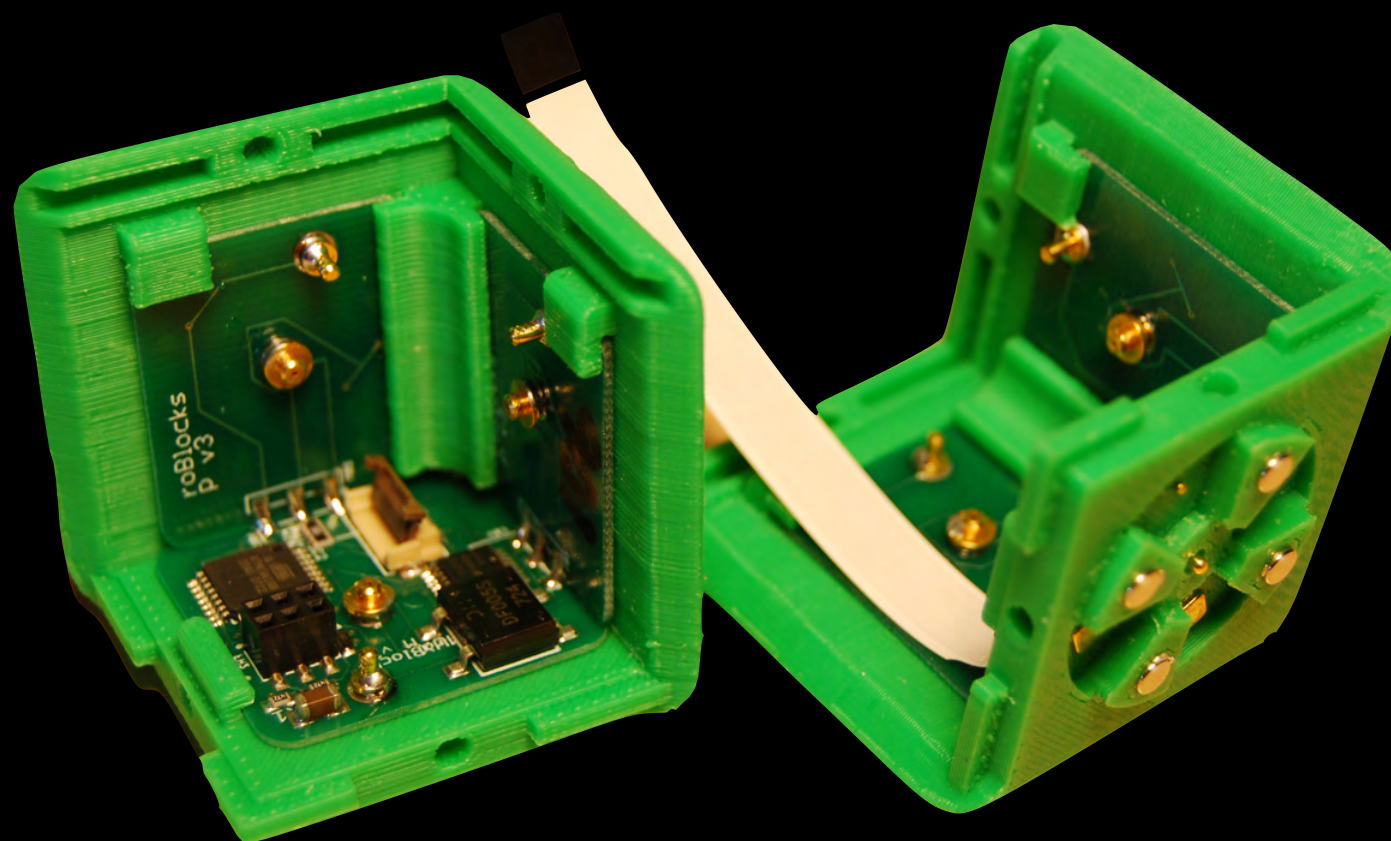
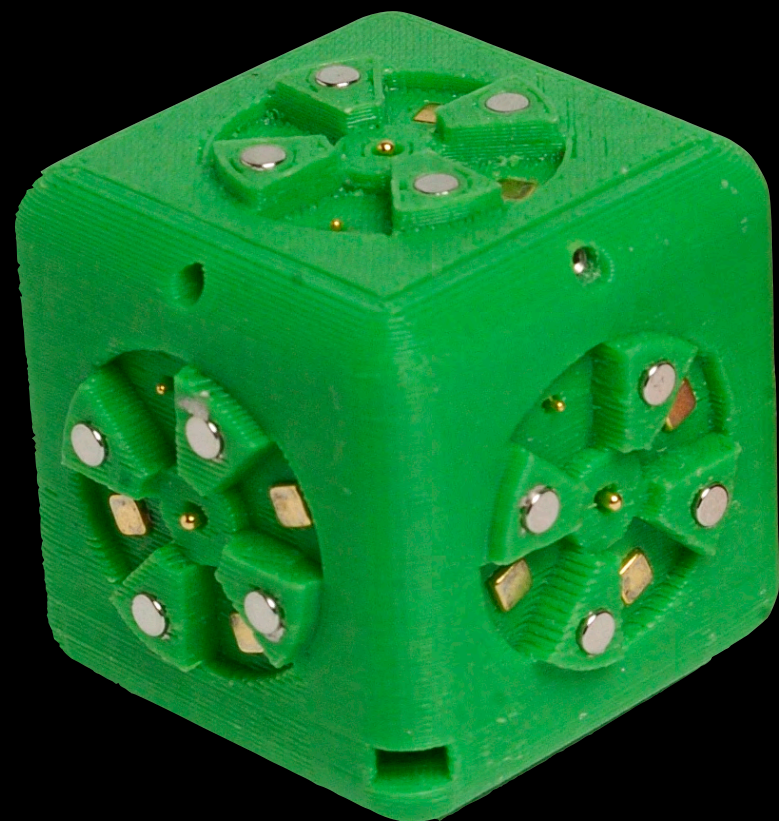


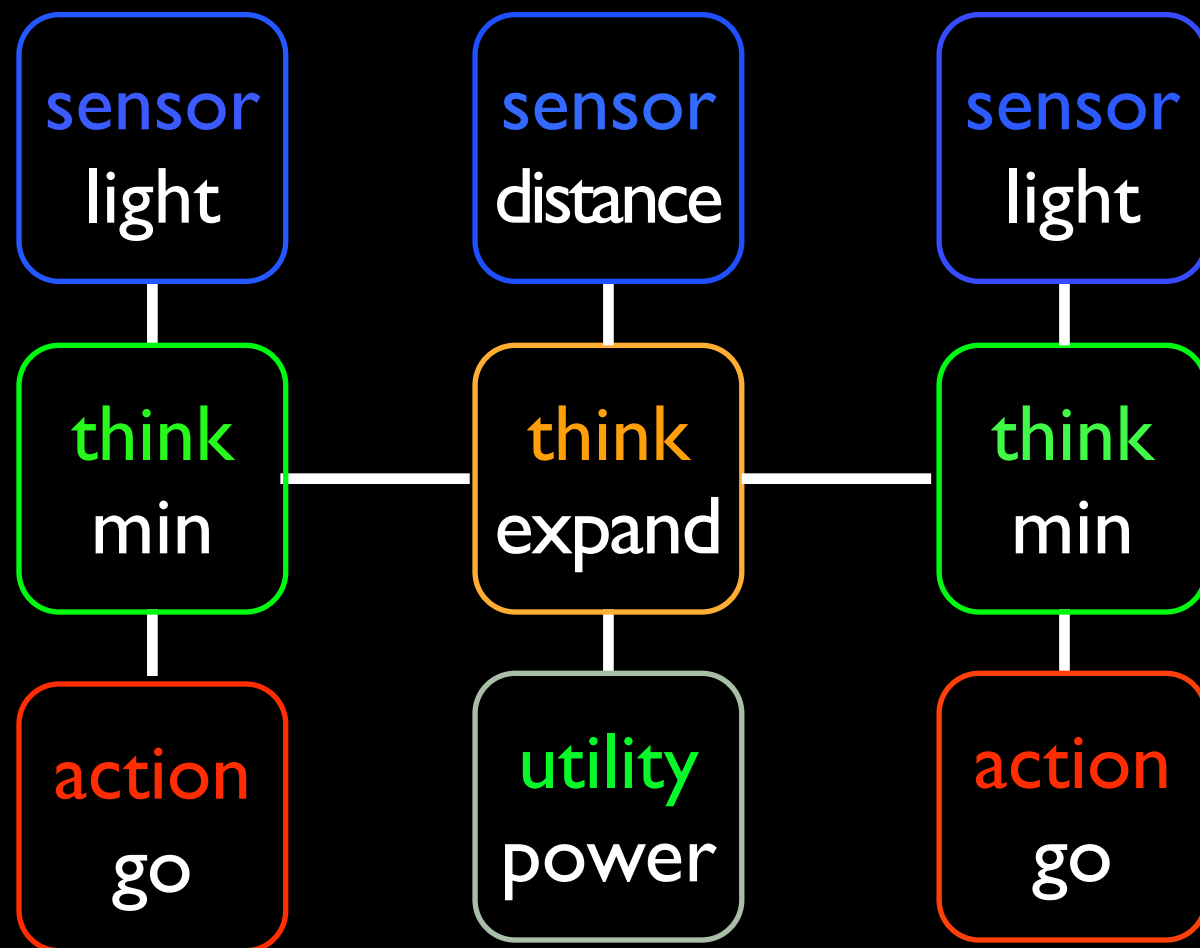


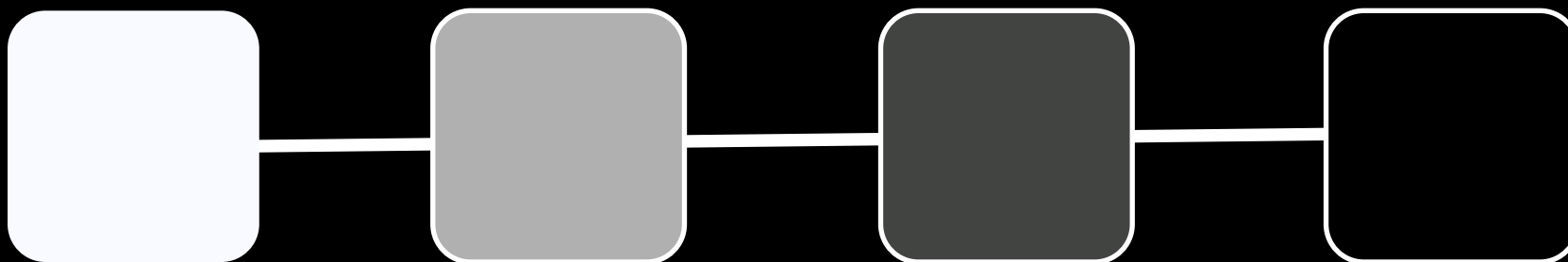
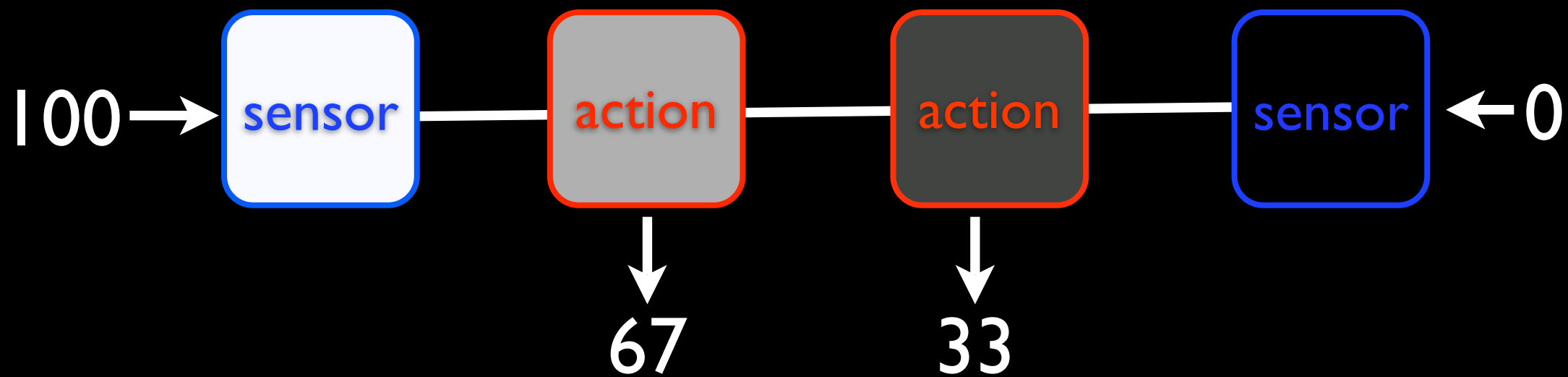






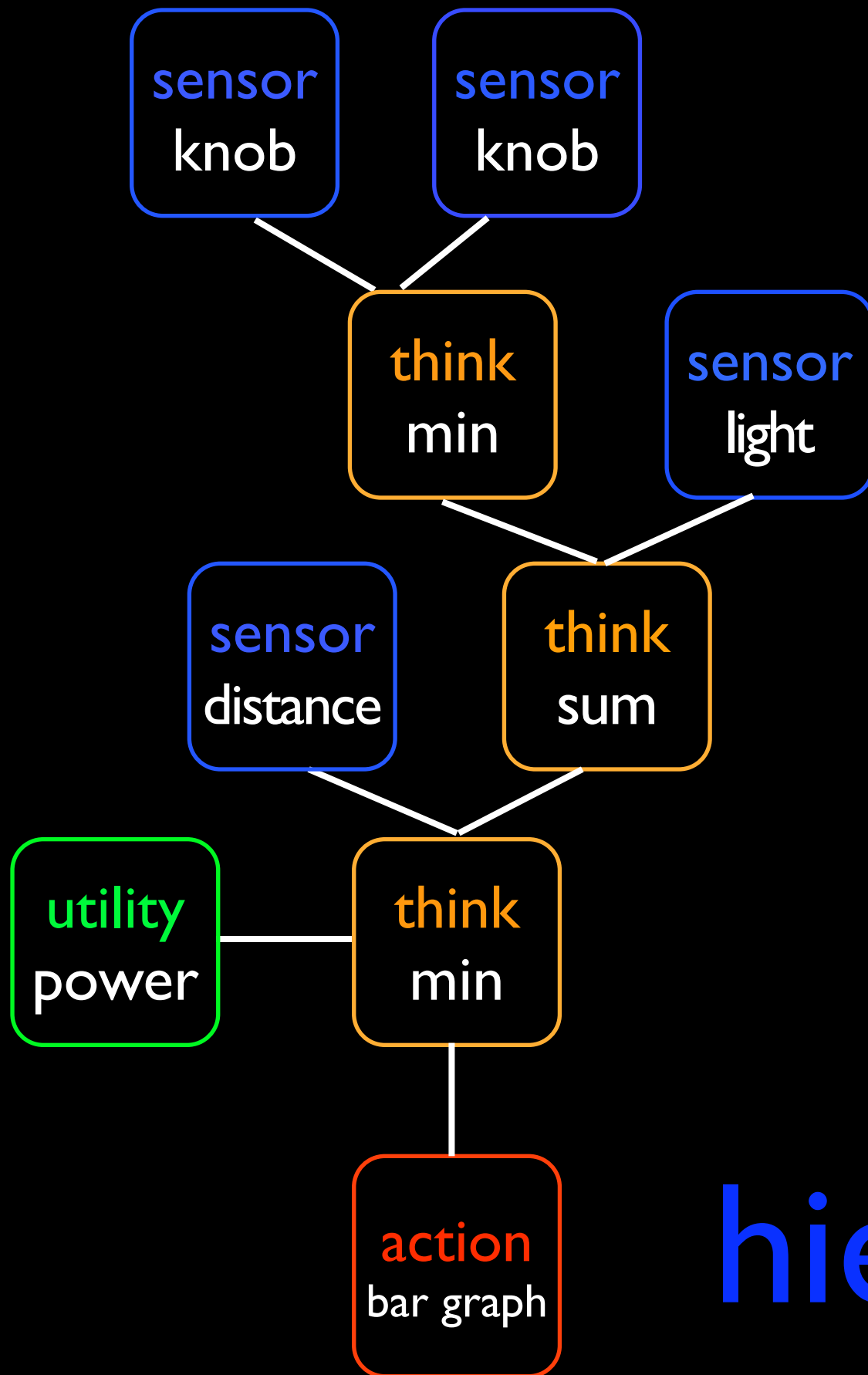






$$\frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i}$$





# hierarchy

# debugging



demo?



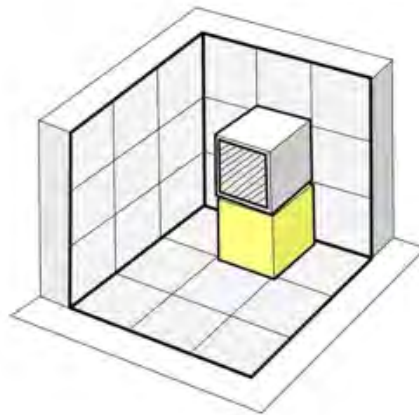


human hive

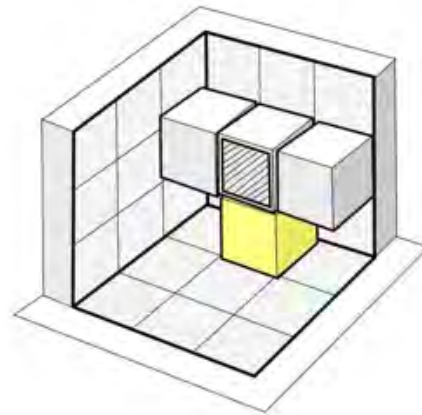




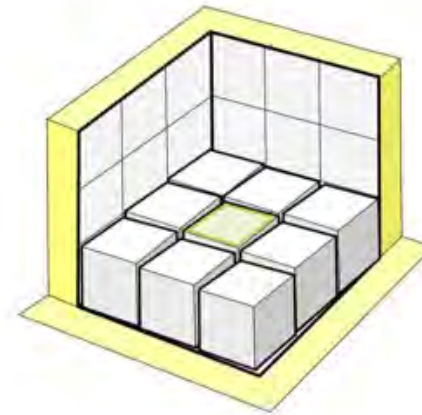
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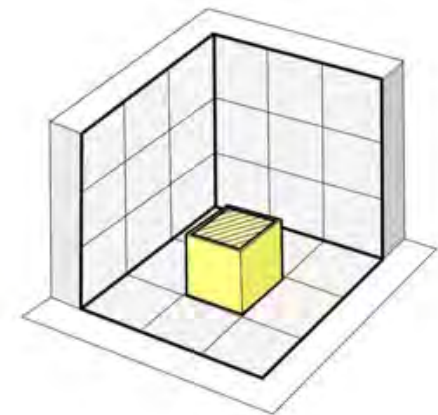
tower 1



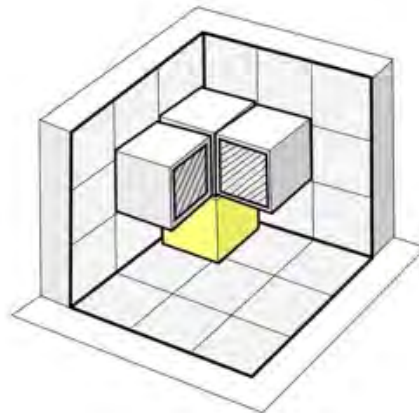
tower 2



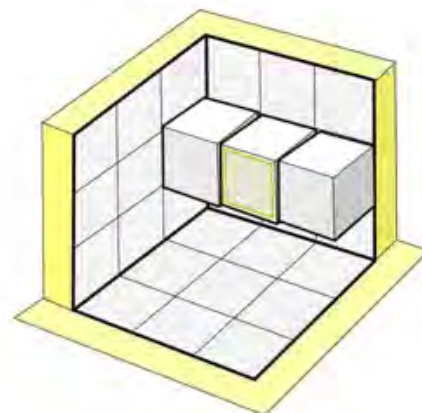
tower 3



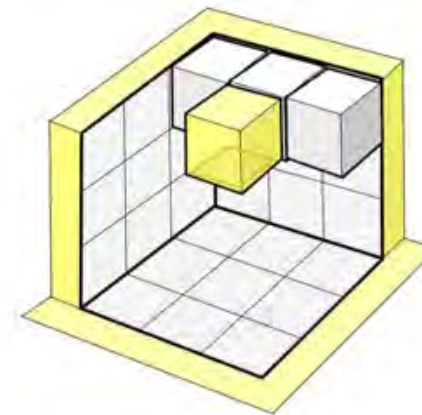
tower 4



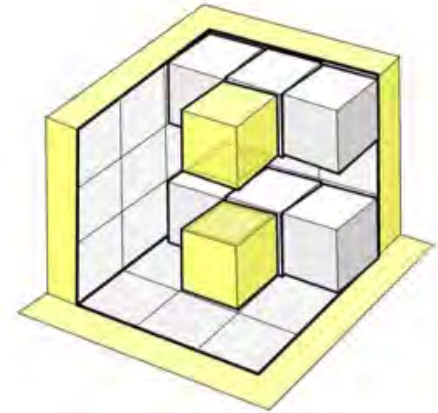
tower 5



tower 6



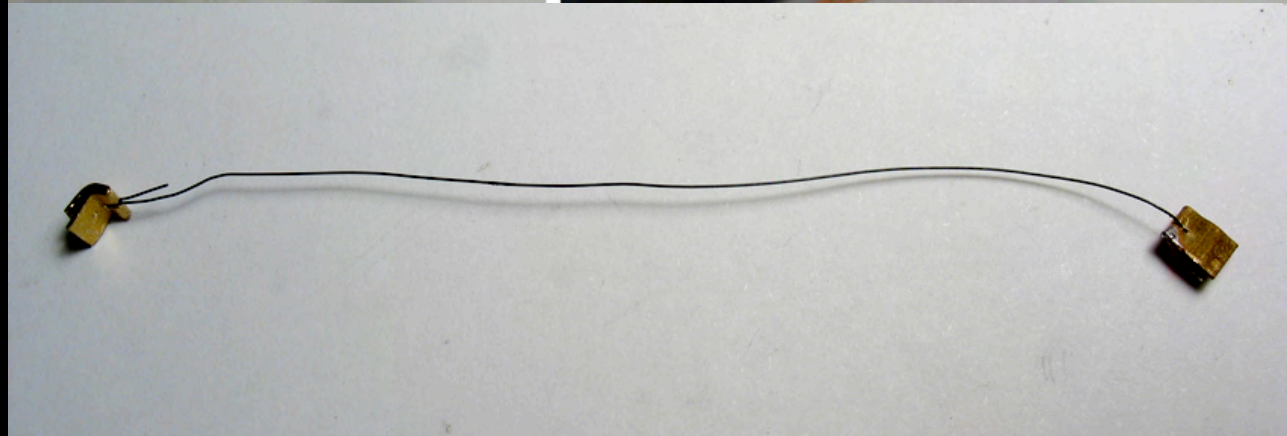
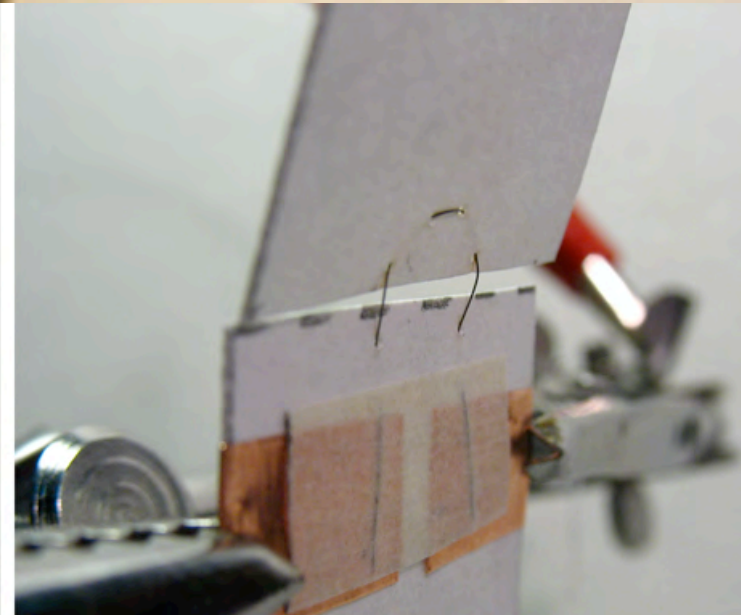
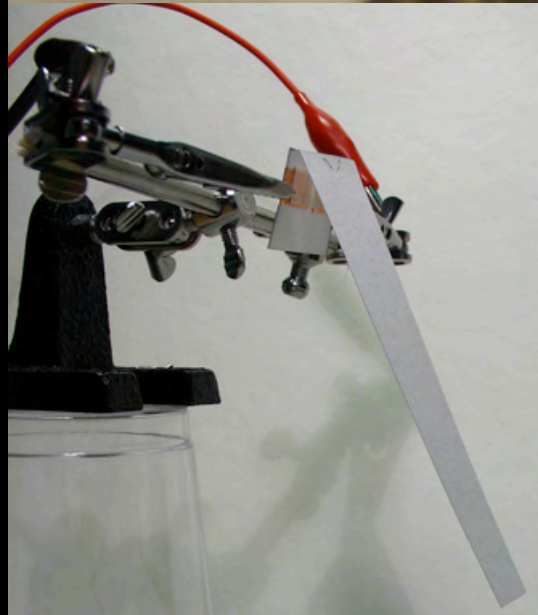
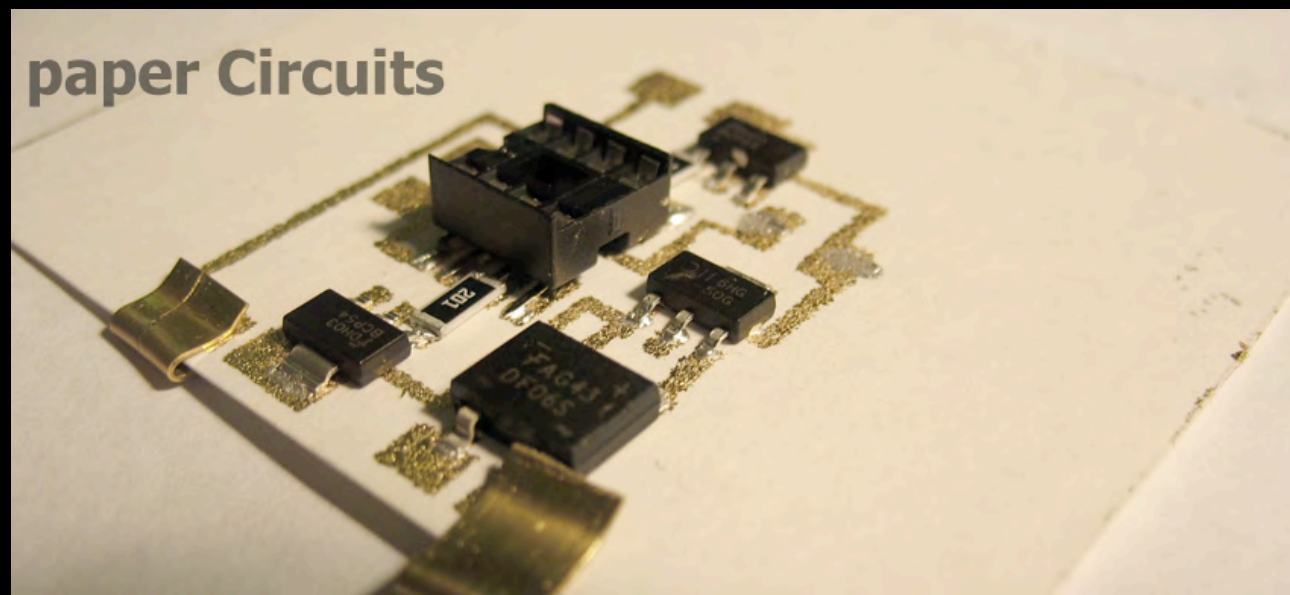
tower 7



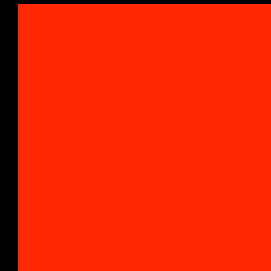
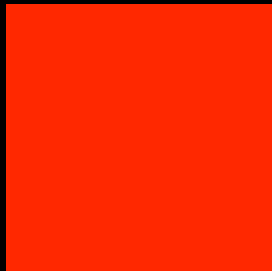
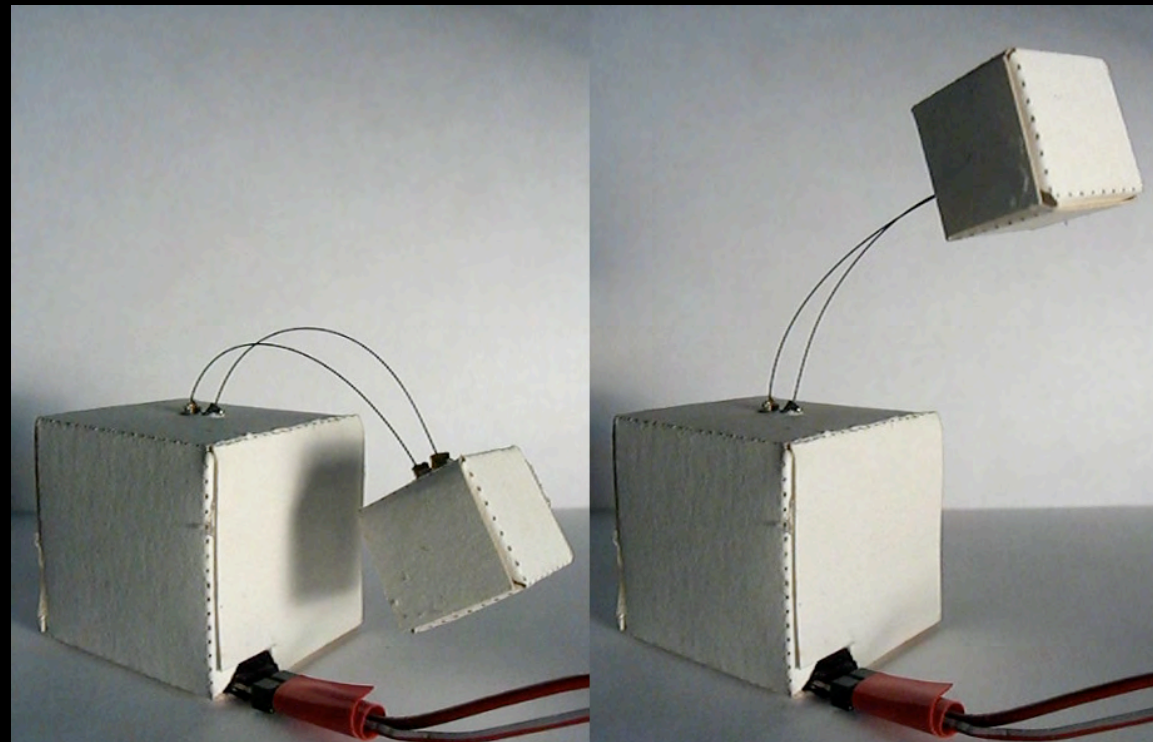




paper robots







to create is to make

to design is to program

tak !