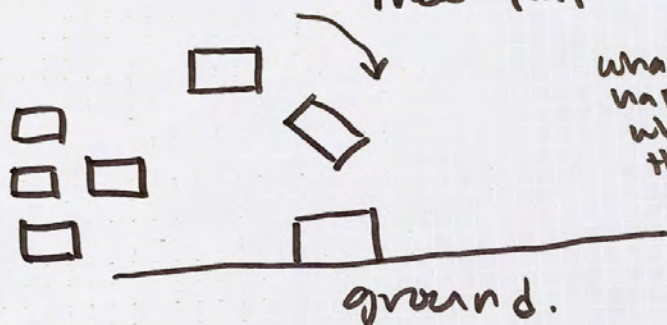
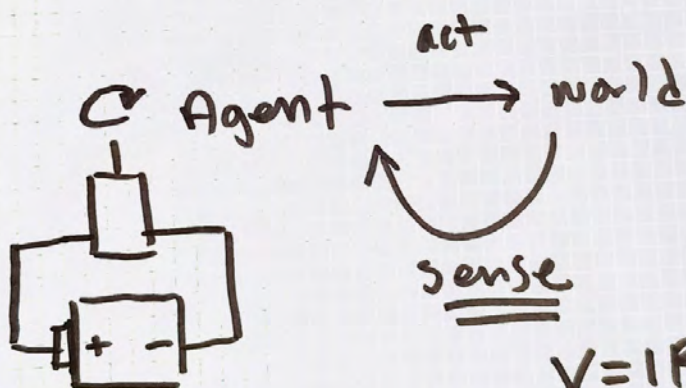


COGS 300 Movement 02 Sep 11 ①

Warm up: Draw rectangles in free fall...



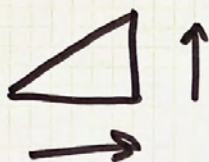
what happens when they hit?



$$V = IR$$

↑ ↑

②



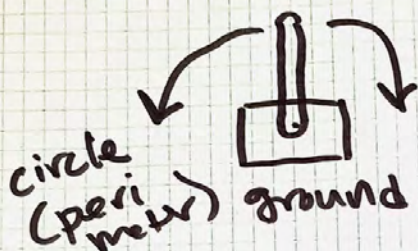
distance \longleftrightarrow power

Rotation \longrightarrow rotation

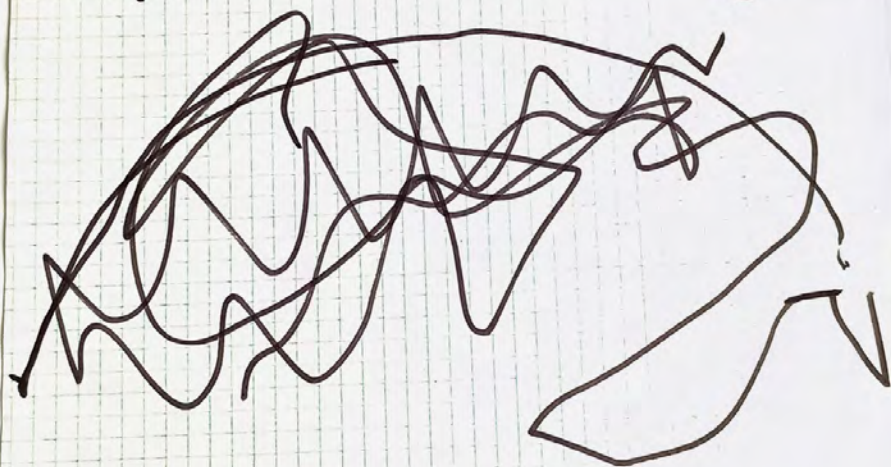
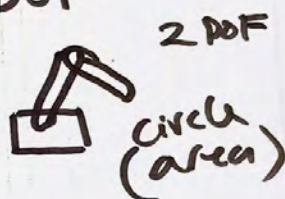
DC \searrow linear movement
gear train

biomechanics.

DOF: Degrees of Freedom ③



1 DOF



3 DOF
Sphere

6 DOF

Grounded

vs.

ungrounded

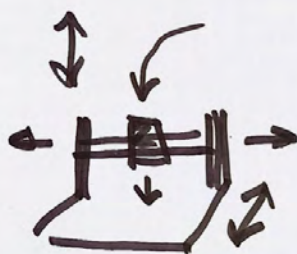
④

(ambulating)
free-moving

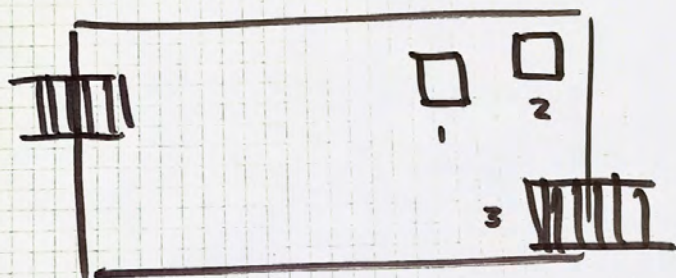
↓
still
moving

→ track / gantry

tram



Design a pick+place robot ⑤



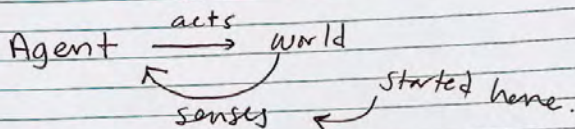
- ambulation : reducing error
 - end effector (grasper)
 - arm
- base
- articulating portion

C O G S 300

Movement 02

Sept 11/25

Last time, we saw digital + analog sensors.
 IF you're still getting used to them, don't
 worry — lab will get it worked out.

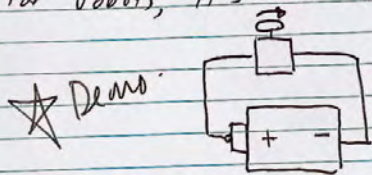


What does "acting" mean? Motion (motor)
Display (light)

but let's focus on motion.

Everything you can "do" (except think)
 is muscle output.

For robots, it's almost exclusively DC motors.



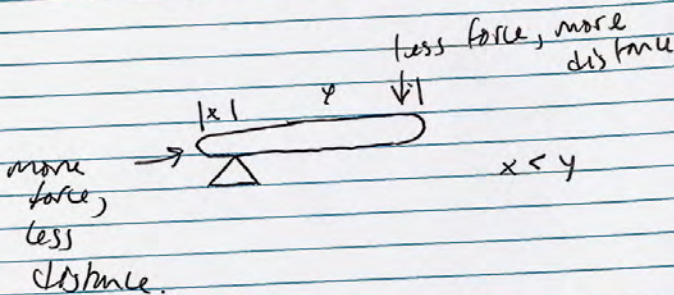
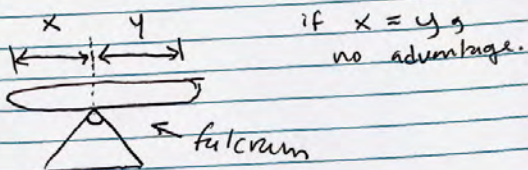
$$V = IR$$

More Voltage = more current for same R
 But! Design trade offs. Can't have
 a 9000V battery... without fire...

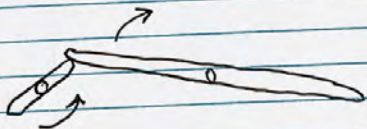
②

So you need mechanical advantage.

A lever is a simple machine:

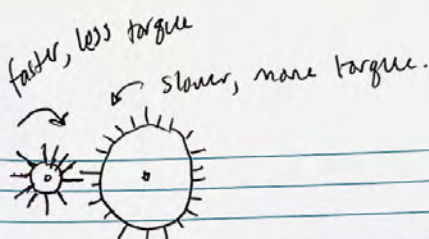


If you want to keep transferring force, it's like adding a lot of levers together. to make a gear:

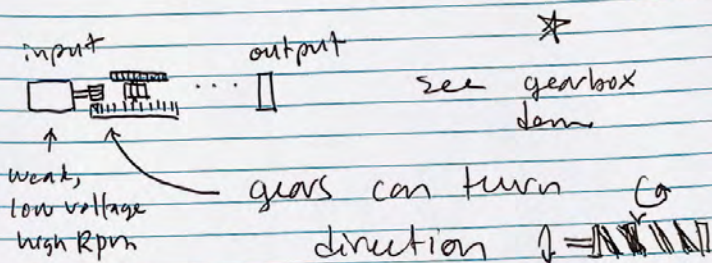


distance \leftrightarrow power where small turns fast + often with low power, large turns slow w/ high.

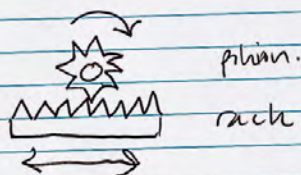
3



a gear train is when many are connected.



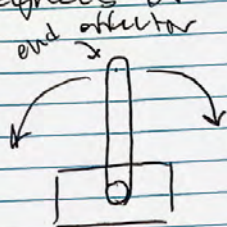
or translate linear to rotational motion



body has levers: arm demo.

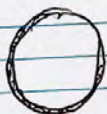
(4)

DoF : Degrees of Freedom.



trace out
working
area.

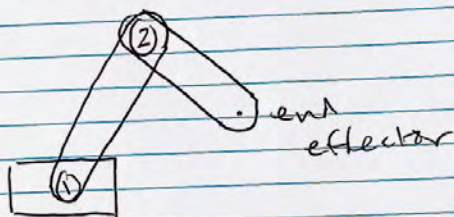
↑ grounded



circle.

How to reach
inside circle?

2 DoF:

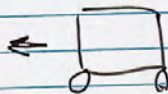


sphere?

3 DoF.

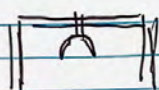
+ "right
turn"

grounded vs. ungrounded.

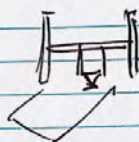


moves

on a track / getting what robots
operate like
hu's?



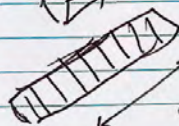
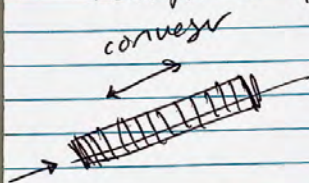
cranes



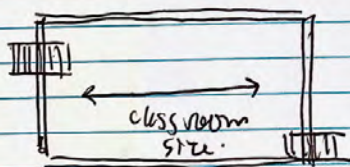
3D
printer

Design Challenge:

Design a pick+place robot:



Two conveyors, two bins.



Design a robot to sort
parts.

(6)

Draw/out out parts, build parts.

build as much as you
can.

- ambulation.
- end effector
- arm

Analyze: # of DOF
 potential error
 sensors needed