DC Motors
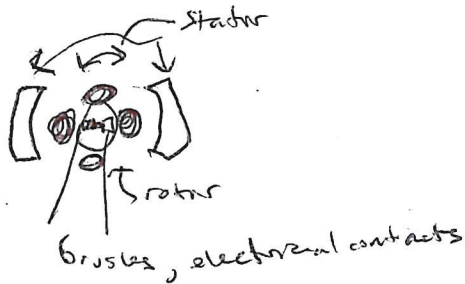
- used in a variety of robotics applications
  - ↳ motion/speed
- construction → permanent magnet motor

brushes, electrical contacts

on the rotor there is a commutator

 → by hand demo

dc motors

↳ see slides

Good for:
Speed and torque control (at higher speeds
- But! τ ↓, still torque

no load speed
ω

stepper motors
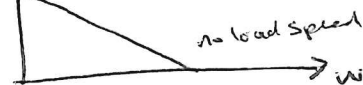
 ← coils arranged in phases
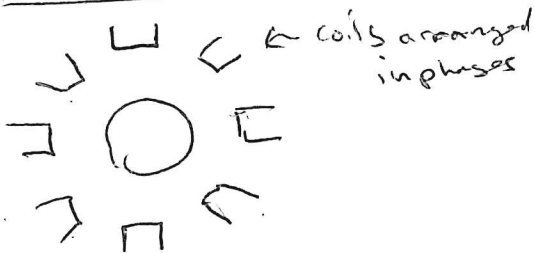
- By energizing each phase in sequence, the rotor will rotate one step at a time
- Before we talk about how it works, let's cover applications

Good For:
position control → move precisely in repeatable steps   (CNC)

  Speed control: precise increments allow excellent control of rotation (process control/robotics)
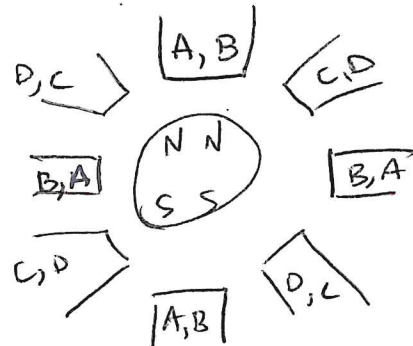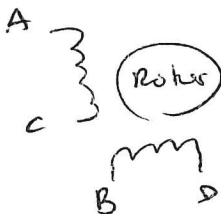
  Low speed torque: maximum torque at low speeds

Limitations
- low efficiency   more current when no work often
- unless you use specific (serial) drives requires a lot of pins
- bad high speed torque
- No feedback (limit switches or home detectors)

Bipolar Stepper

- 2 phases - Four wires, 2 per phase

"ON = NORTH"

sequence

$A \quad \bar{B} \quad C \quad \bar{D}$
$\bar{A} \quad \bar{B} \quad C \quad \bar{D}$
$\bar{A} \quad B \quad C \quad \bar{D}$
$\bar{A} \quad B \quad \bar{C} \quad \bar{D}$
$\bar{A} \quad B \quad \bar{C} \quad D$
$\bar{A} \quad \bar{B} \quad \bar{C} \quad D$
$A \quad \bar{B} \quad \bar{C} \quad D$
$A \quad \bar{B} \quad \bar{C} \quad \bar{D}$

Note: A, B move on together
      C, D move on together

our motors are $1.8°$ per step $\Rightarrow$
200 steps / revolution
$\Rightarrow$ our sequence needs 25x to go 360°
$14.4°$ per sequence

o To Improve mechanical advantage and
get better torque, we use gears.
↳ we will learn a little more about
gearing in the future.