Haptics

- Haptics is any form of nonverbal communication involving touch
- Haptic technology takes advantage of the sense of touch by applying forces, vibrations, or motions to the user.
- It has been described as "doing for the sense of touch what computer graphics does for vision".
- Haptic technology has made it possible to investigate how the human sense of touch works by allowing the creation of carefully controlled haptic virtual objects. These objects are used to systematically probe human haptic capabilities, which would otherwise be difficult to achieve.

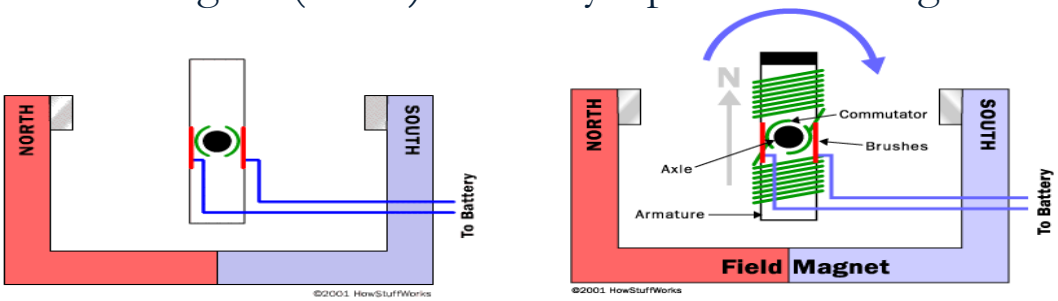
Creating Haptic Sensation

- Haptic sensations are created in consumer devices by actuators, or motors, which create a vibration.
- The rumble effect in your console game controller and the reassuring touch vibration you receive on your smartphone dial pad are both examples of haptic effects.
- With haptic technology, users feel the vibrating force or resistance as they push a virtual button, scroll through a list or encounter the end of a menu.

DC Motors

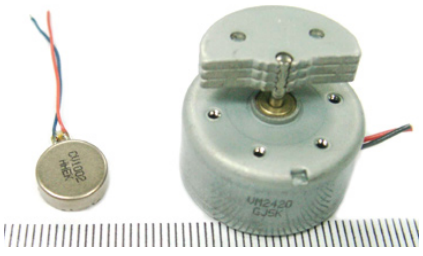
Armature (rotor) is an electromagnet

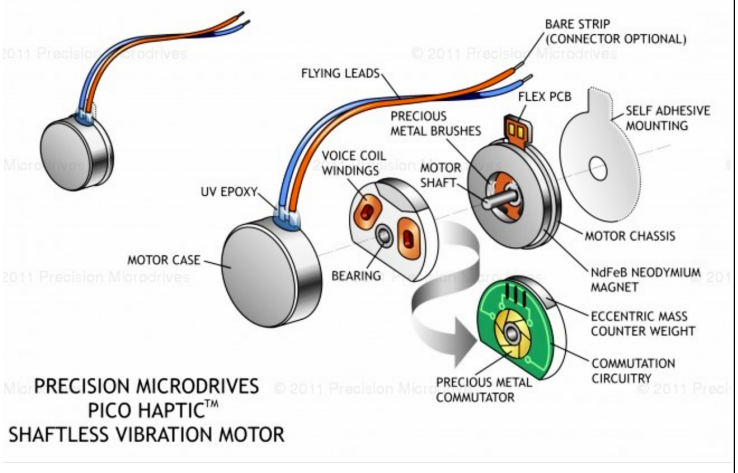
Field magnet (stator) is usually a permanent magnet



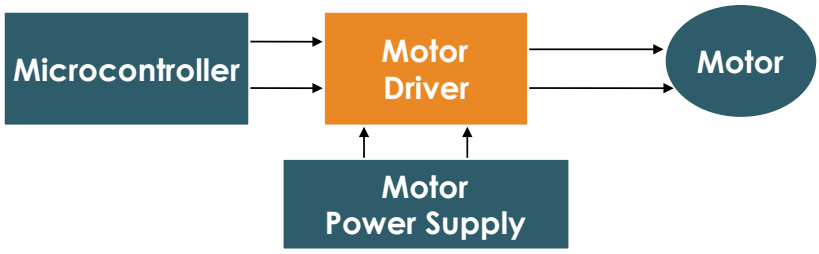
Vibration Motor

The vibrating alert is produced by a small electric motor connected to an eccentric (unbalanced) weight.





Motor Drivers



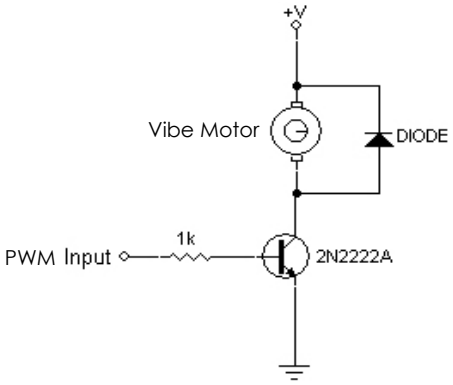
Basic Block Diagram of a Motor Controller

Motor Drivers : Solid-State

- Drivers built using Transistors or MOSFETs
- Fast, Efficient and Small
- Also available in Integrated Packages
- Ideal for our needs !!

Motor Drivers : Solid-State

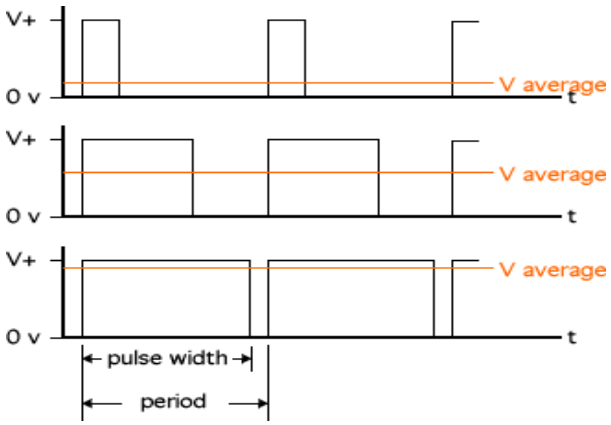
Basic Motor Driver (ON/OFF) using a BJT



Speed control

- How will you vary the speed of the Motor?
  - Controlling the voltage across the Motor or the current through the motor.

DC Motor : Speed Variation



PWM Control :
Pulse Width Modulation

$$V(avg) = \frac{\text{pulse width}}{\text{period}} \times V(in)$$