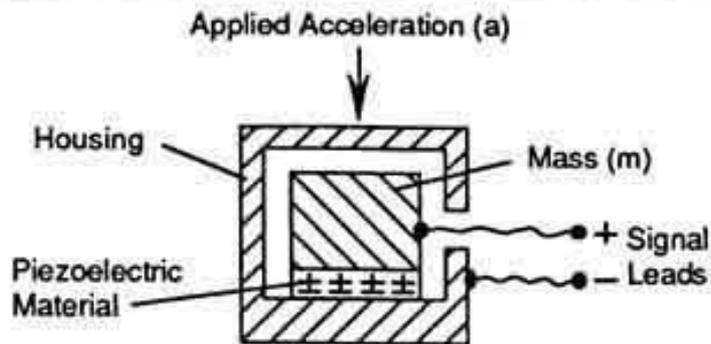


# Sensors, Part 2

Spring 2026

# Sensors: Orientation

- IMU – Inertial Measurement Unit
- Measures Accelerations
- Can integrate to get position
- Picks up a lot of background noise

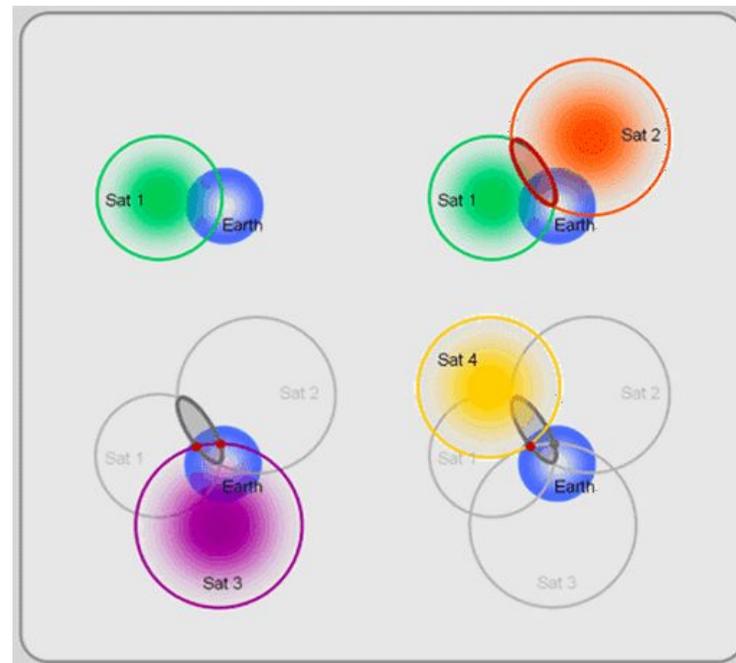
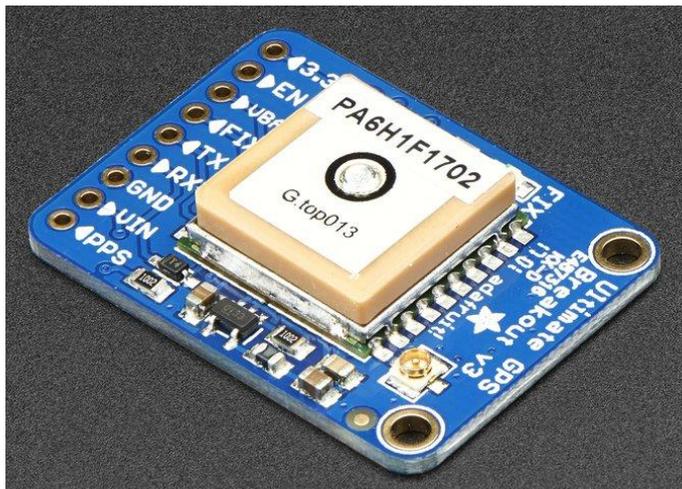


# IMUs in Space!



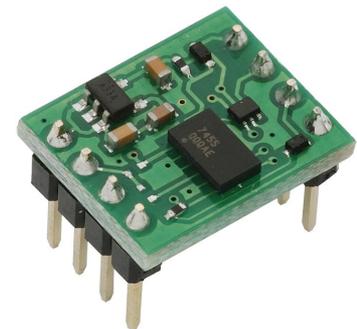
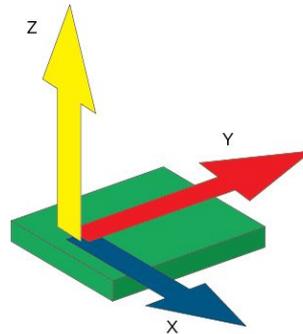
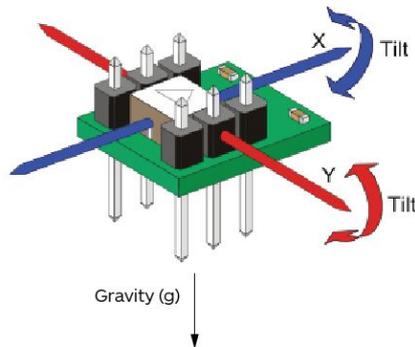
# Sensors: Location: GPS

- Location
- Uses distances from 4+ satellites to determine position
- Breakout boards available, but a bit expensive.



# Your Sensors: Accelerometers

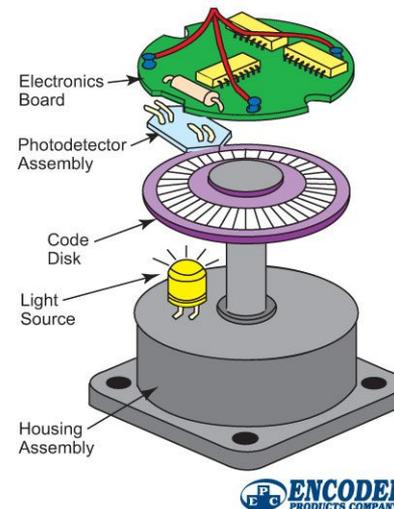
- Measures acceleration.
- Since you can measure acceleration due to gravity, you can determine if your robot is tilted in respect to the Earth.
- They either contain crystal structures sensitive to accelerative forces or capacitance detectors.



Diagrams illustrating the axes of 2-axis (left) and 3-axis accelerometers. This particular 2-axis sensor is also capable of tilt measurement.  
Image credit: Parallax | Kerry Wong

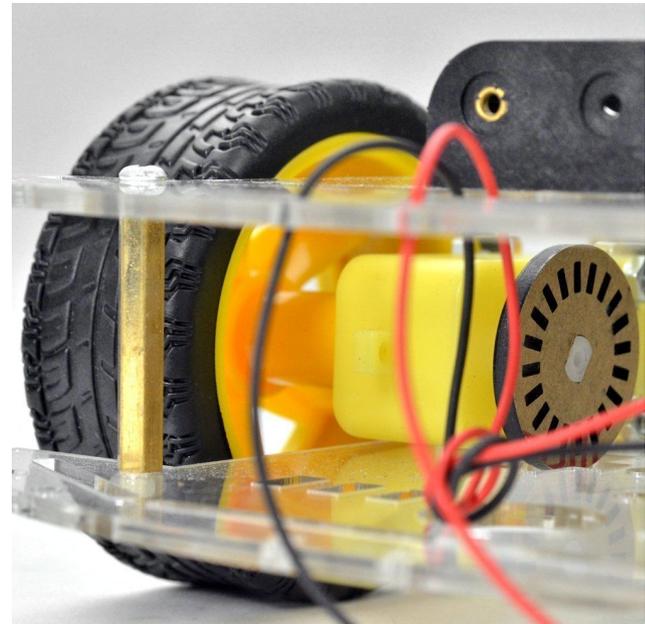
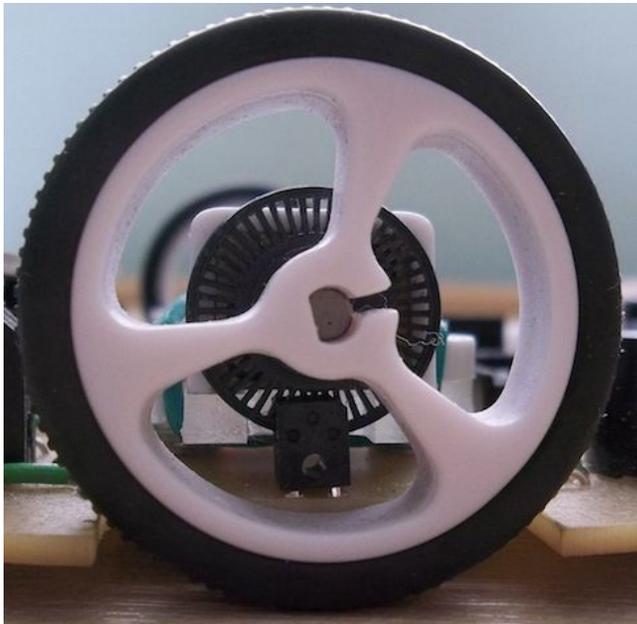
# Your Sensors: Encoders

- Converts the motion or position of an actuator to a signal that we can read.
- Lets us know how many times a motor has rotated/ helps us determine distance moved



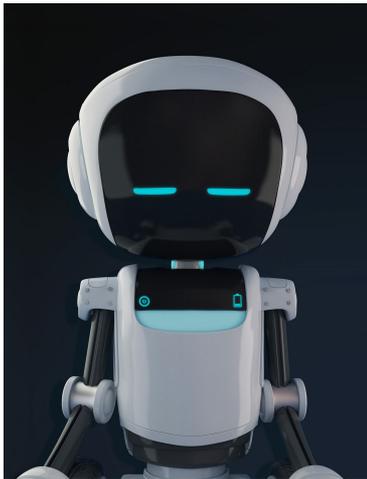
# Bonus Question!

- Why are encoders more accurate than motor timing?
- Why might encoders not be accurate?



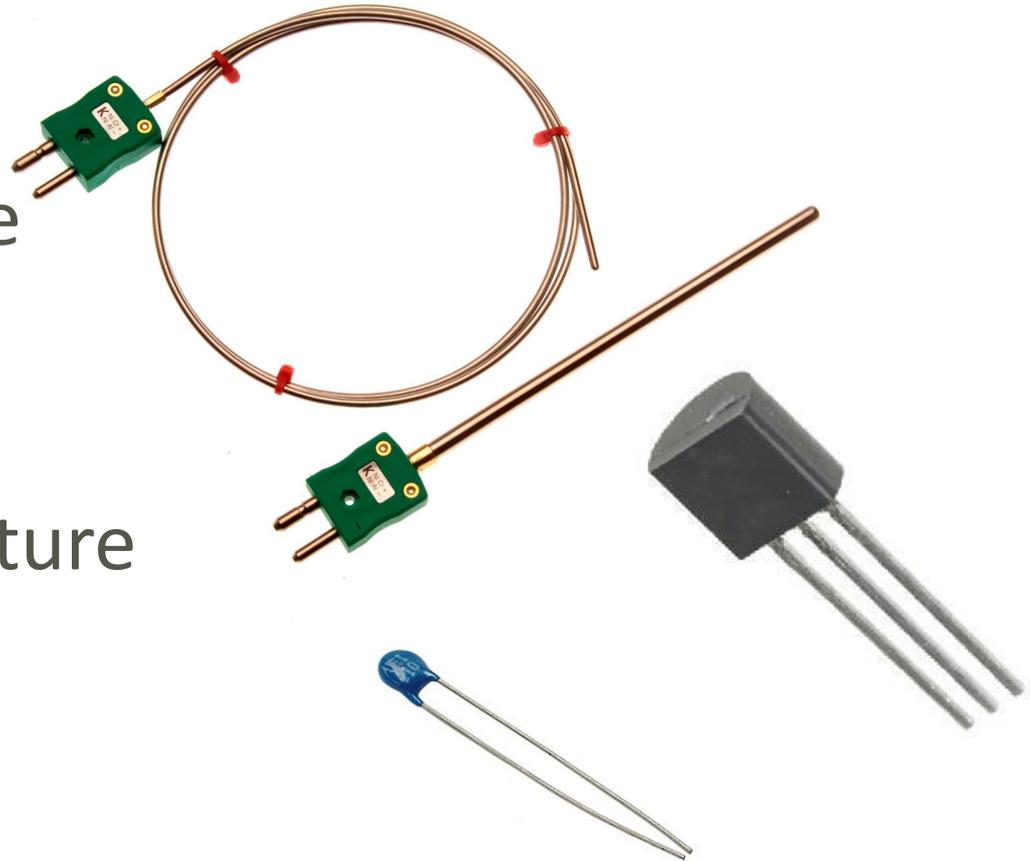
# Answer:

- Encoders will work better than motor timing if one motor is worse than the other, or if battery power is an issue. In those circumstances, the motor power may not be reliable.
- If the wheel slips, the encoder will register wheel turns without the robot actually moving forward.



# Sensors: Temperature

- Thermocouple
  - Voltage difference from differences in two metals
- Resistance Temperature Detector (RTD)
- Thermistor
- Used to monitor temperature



# Sensors: Sound Level

- Microphones?
  - Sure!
- Either return soundwave or average sound level
- Respond to changes in air pressure

