Wireless Sensors

1. Motivation

→ Separate the sensor from the user / processing electronics

→ Remove cables between sensor and user

- → Lower the cost
- → Lower the weight
- → some applications cannot afford cables

  ex: rotating objects
  small vehicles
  in-the-body medical sensors
  in hazardous environments
  inside sealed objects: pipelines, pressure vessels

2. Requirements

① Low power sensor

② Output data in a transmittable format

③ Technique for powering the unit:

a. Long-life batteries

b. Energy scavenging from the environment

- → ambient light
- → mechanical vibration or sound
- → thermal difference
- → fluidic motion

c. Wireless energy transmission

- → RF
- → Inductive coupling

→ Laser beam

→ Sound (ultrasonic)

④ Wireless Communication Technique

a. RF

b. Inductive coupling

c. Color change

d. Sound

e. Optical

⑤ Suitably Integrated Package

a. Size

b. Weight

c. Mounting → adhesive/flexible/rigid

d. Cost

e. Sufficiently rugged

⑥ Single or Multi-sensor application

a. Single sensor is straight forward.

b. Multi-Sensor is more complicated

→ Each sensor could have a unique ID

→ Each sensor could send its data at a unique time

→ Each sensor could send its data at a unique frequency

→ The sensors could be organized into a sensor network, relaying data through a "master" unit

→ The sensors could self-organize into an ad-hoc sensor network (like a swarm) and communicate with the user