SENSOR PLATFORMS
WHY SENSORS?

We respond to our environment ...

... a sensor equipped environment responds to us.
TECHNOLOGIES FOR A RESPONSIVE ENVIRONMENT

- Inertial sensors
- Ultrasonic ranging
- 3D Laser imaging
- Wireless charging
INERTIAL SENSORS

- Navigation
- Crash sensors
- User interfaces
- Gaming
MEMS Sensor Enabling Features

- Batch Silicon Fabrication
- Electronics → “Smart”
- Small & low power
- Standard electronic design flow
ULTRASONIC RANGING

MEMS ultrasonic transducer
- Ultra-low power & size
- Optimize for operation in air

User interfaces

Touch display
3D IMAGING

Target Diode Laser
Backscattered Light
Frequency Modulation
Smart-Pixel Receiver
Diffractive Optical Element (DOE)
Beamsplitter
10x10 Array of Pencil Beams

LO
Optical Integration

Integrated Optoelectronic Phase-Locked Loop (OPLL)

(A) Optical Integration

(B) Principle of FMCW

f_{beat} = \frac{2RF}{cT_m}

optical Frequency

Backscattered Light

Avideh Zakhor

Wu, Chang-Hasnain, Yablanovich, Chuang, Boser
**Wireless Charging**

- Capacitive
- Unobtrusive
- Negligible volume
- Power & high-speed data
UBIQUITOUS SENSING

At the core of an Aware Environment that
- Recognizes presence
- Supports actions
- Adjusts to needs
- Is unobtrusive