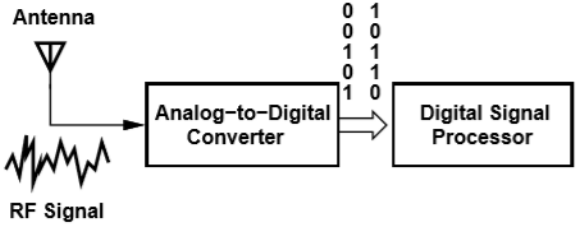
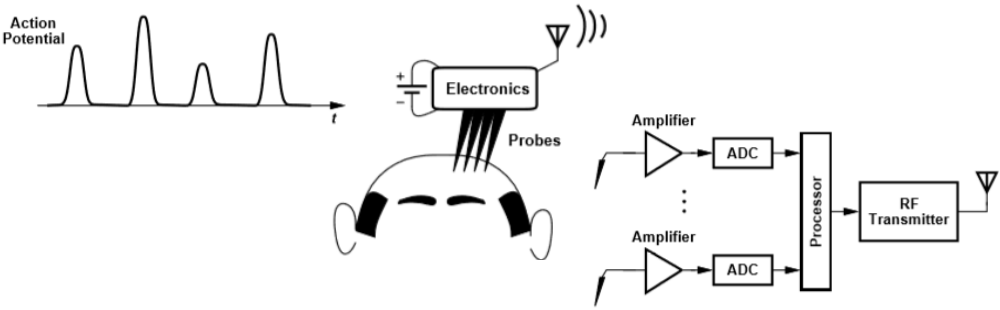
Chapter 1: Introduction to Analog Design

Sensing and Processing Signals



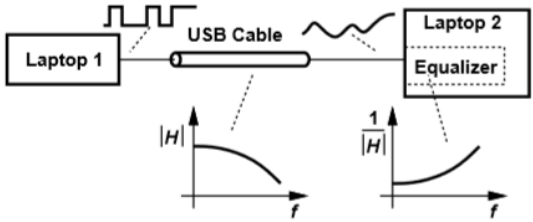
- **Many electronic systems sense (receive) a signal and then process and extract information from it.**
- ***Processing* preferably occurs in digital domain.**
- **Sensing interface still demands high performance analog design.**

Sensing and Processing Signals



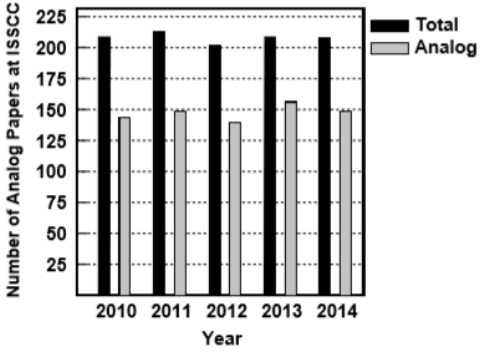
- **Neural activity generates electric pulses a few mV high and a few 100 μ-seconds long.**
- **Signal produced by probes monitoring activity must be amplified, digitized, and transmitted *wirelessly*.**
- **Need low power electronics for this application.**
- **Analog circuits consume most of the power in a system.**

When Digital Signals Become Analog



- Equalization to compensate high-frequency attenuation in a USB cable.
- An analog equalizer is more efficient than an ADC at very high data rates (e.g. tens of gigabits per second).
- Conversely, at lower speeds it is more efficient to digitize the signal and perform required functions in digital domain.

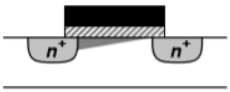
Analog Design is in Great Demand



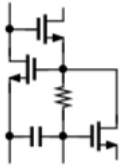
- **Although analog circuits are typically quite less complex than digital circuits, the majority of papers belong to analog design.**
- **Design challenges include transistor imperfections, declining supply voltages, power consumption, circuit complexity, and PVT variations.**

Levels of Abstraction

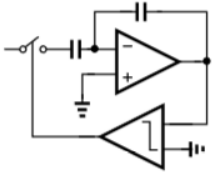
Device



Circuit



Architecture



Switching between levels of abstraction is necessary for

- **understanding the details of operation.**
- **optimizing the overall performance.**

- **Interaction between all groups in industry is essential for high performance and low cost designs.**

System