Presentations

Basics
Importance of presentations

• Real world -- Often more important than:
  – quality of work done
  – importance of discovery or invention

• Major factor in:
  – salary
  – promotions
  – opportunities
Elements of technical presentations

• Must include sales pitch
  – Why should audience listen
  – Preferably also in title

• Must start out with excitement
  – All technical details come later

• Should be brief
  – Real-world -- 20 minutes is very long time
Sales pitch

• Know your audience

• Example -- presentation to boss
  – find out background
    • highest degree, major, thesis title?
    • look up resume, publications, patents
  – find out goals
    • examples: get rich quick, grow company

• Example -- presentation to customer
  – find out customer needs
    • research details of customer business
    • past and current problems
    • anticipate future problems -- ex: competitors
Excitement

• Concentrate on important problem
• Example -- presentation to boss
  – sales trend over the past year
• Example -- presentation to customer
  – competitors latest advances
Technical details

• Describe new concepts by analogy
  – Example -- presentation to boss
    • choose examples from boss’ field of expertise
  – Example -- presentation to customer
    • choose examples from customers business
Detailed example

• Presentation of design and performance of laser intensity servo
• Audience: DVD manufacturer
• Sales pitch:
• Excitement:
  – Ten-fold increase in data rate (projected)
• Technical details:
  – data rate limited by ability to recognize time-domain signal
  – laser intensity noise:
    » distorts signals, changes threshold levels, can give false signals
  – laser intensity servo reduces noise by factor of 10 or more
    » fixed data rate -- better bit error rate
    » fixed bit error rate -- faster data rate
  – project factor of 10 increase in data rate
• Choose title: Super-laser for ultra-fast DVD readout
Super-laser for ultra-fast DVD readout

- Stop!
- Don’t put that noisy laser in your quiet DVD reader
- Make your laser a “super-laser”

- Compatible with existing DVD designs
- Field installable upgrade
Problem (including background info)

- Fast DVD readout system
  - discriminate among code words in a set
  - faster than reading individual bits
  - not simple threshold -- correlation
  - intensity noise can distort

.Code word recognition

effects of intensity noise

Signal #1

signal #2

Resolwed bits

ideal

actual

threshold

signal #1

intensity
noise

signal + noise

Compare to signal #2

Signal #1
Solution (note use of graphics)

- Add-on intensity servo
- Suppresses noise factor of 10
- Ultra-high speed data
- Original noise prevents discrimination
- Reduced noise allows discrimination

![Diagram showing high speed data and noise reduction](image-url)
Design details (example customer knows)

- Put AOM in laser path
- Undeflected beam:
  - no change in alignment
  - attenuated by increase in rf power
- Alternative: control current to laser diode
  - mode hops, frequency chirping?

![Diagram of laser system with AOM, laser diode, DVD, and detectors]
Conclusion (take-away message)

• Super-laser performance w/o super laser
  – Add-on intensity servo
    • Order or magnitude increase in data rate
    • Field upgradable
    • Technical details
      – exist, but not exciting
Second example

• Noise canceling headset
  – illustrates importance of inventing names
  – audience will pay attention at least 3 min to find out what it means
  – enough time for motivation
Noise canceling headset

• Problem:
  – Careful speaker design can reproduce music exactly
  – But acoustic noise in environment still interferes
  – Acoustic shielding suppresses noise
    • Also suppressed music

• Solution:
  – Suppress noise but not music
  – Sounds good, but how?
Use servo to eliminate noise

- Standard noise cancellation
  - Acoustic shielding
  - Eliminates noise but also music
  - Bulky and heavy

- Solution:
  - Active servo system
  - Servo samples noise (microphone) and cancels (speaker)
  - Suppression is controlled by gain
  - Can be smaller and lighter

- How to avoid canceling music?
Implementation

• Technical details
  – Put music into reference channel of differential amp
    • When microphone input matches music – common mode gain suppressed

• Final result
  • Music is not canceled
  • But noise is still canceled

• Best of both worlds
Conclusion

• Better than the best speakers
  – Not only reproduces music well but eliminates noise

• Spin-off benefits
  – Smaller lighter ear protection
  – Cheaper speaker components
    • Servo gain also compensates for any speaker nonlinearity
Servos are everywhere

- **Electro-Mechanical**
  - Cruise control
  - Power steering and brakes
  - High-performance robots

- **Electrical**
  - Linearity of electronics
    - High power devices often inherently nonlinear
  - Phase lock loops for frequency stability on radios, cell phones

- **Electric-Optical**
  - Laser diode intensity stabilization
  - Tracking and focus lock for DVDs

- **Human**
  - Hand-eye coordination involves feedback
    - Has gain and can oscillate if gain too high
  - Telemedicine