

6.003: Signal Processing

Wrap Up

- 6.003 Content Retrospective
- 6.003 Pedagogical Retrospective
- What Comes After 6.003?
- Tell Us How To Improve 6.003

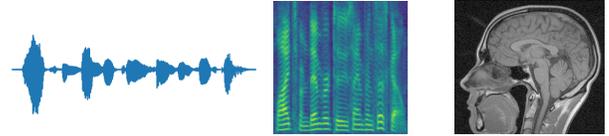
December 9, 2021

6.003: Signal Processing – Content Retrospective

Signals are functions that contain and convey information.

Examples:

- the MP3 representation of a sound
- the JPEG representation of a picture
- an MRI image of a brain



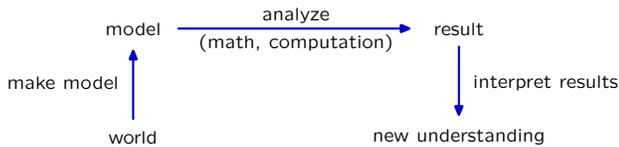
Signal Processing develops the use of signals as abstractions:

- **identifying** signals in physical, mathematical, computation contexts,
- **analyzing** signals to understand the information they contain, and
- **manipulating** signals to modify and/or extract information.

6.003: Signal Processing – Content Retrospective

Our approach is the same as that in many technical disciplines.

- **model** some aspect of the world,
- **analyze** the model, and
- **interpret** results to gain a new or better understanding.

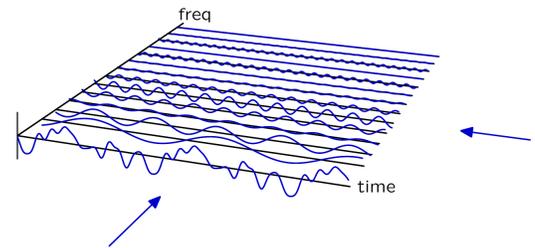


We tried to include examples of **all three** of these steps:

- develop math/computation skills to **analyze** signal processing problems
- recognize real-world **applications** and apply skills to solve them

6.003: Signal Processing – Content Retrospective

Focus on Fourier representations as alternative views of signals that highlight different and often useful aspects of signals.



6.003 Pedagogical Retrospective

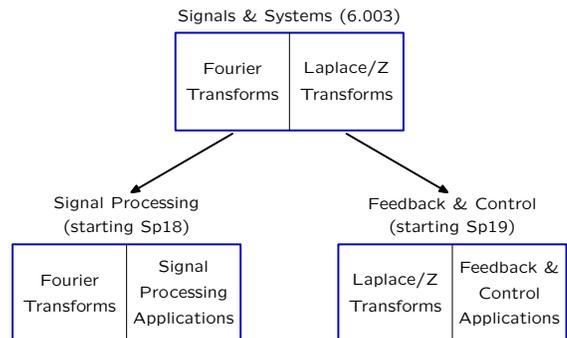
Signals and Systems (6.003) has been a core subject in EECS since 1979 when the four subject (60-unit) core was established.

- 6.001: Structure and Interpretation of Computer Programs
- 6.002: Circuits and Electronics
- 6.003: Signals and Systems
- 6.004: Computation Structures

Many interesting applications were delayed until advanced subjects.

Moving Applications Back into Foundation Subjects

From “interesting math” to authentic applications.



Goal: integrated applications demonstrate usefulness of theory, but also deepen understanding of that theory.

Changes In Content

Focus on signal processing allows for

- contextualizing theory with applications, and
- exploring areas previously reserved for more advanced subjects

Continuing Coverage:

- CTFS and DTFS
- CTFT and DTFT

Added **DFT**:

- Facilitates use of computation
- Close ties to Fourier series and transforms

Added **2D Transforms**

- Interesting applications, with minimal new theory

6.003 Structure is Evolving

Trying to **balance** theory and application effectively is an ongoing process.

Sp18 weekly calendar

- one 90-minute lecture to introduce new material
- one 90-minute individual lab for direct applications
- one 180-minute partnered lab for more open-ended project

Fa18 weekly calendar

- two 60-minute lectures
- two 120-minute problem-solving sessions
- design problems in homework

Sp19 weekly calendar

- two 60-minute lectures
- two 60-minute recitations with worked examples
- two 60-minute scheduled office hours (following recitation)
- design problems in homework with midway checkoffs

What Might Come Next?

- **6.302** Feedback System Design (White)
- **6.011** Signals, Systems, and Inference (Verghese)
- **6.026** Biomedical Signal and Image Processing (Greenberg)
- **6.161** Modern Optics Laboratory (Warde)
- **6.187** Fundamentals of Music Processing (Egozy)
- **6.341** Discrete-time Signal Processing (Oppenheim)
- **6.344** Digital Image Processing (Lim)
- **6.815** Digital and Computational Photography (Durand)
- **6.819** Advances in Computer Vision (W. Freeman)
- **6.556** Data Acquisition/Image Reconstruction in MRI (Adelsteinsson)
- **6.630** Electromagnetics (Notaros)
- **6.701** Introduction to Nanoelectronics (Baldo)
- **6.812** Hardware Architecture for Deep Learning (Sze)
- **18.103** Fourier Analysis
- **18.104** Harmonic Analysis (CI-M)
- **18.085** Computational Science and Engineering I

We Need Your Feedback

We want to present course material in a way that encourages a deep **technical understanding** while also being **fun and engaging**.

We need your help and your feedback in order to make that happen.

- Send us **e-mail, talk** with us, etc!
- Please give feedback to the staff and future 6.003 students:
<http://registrar.mit.edu/subjectevaluation>
- Use the paper questionnaire to provide more **specific 6.003** feedback.

Please use the next **15 minutes** to fill out the Registrar's Subject Evaluation and the 6.003 End-of-Semester Survey.

Finish with an open discussion.

Thank You!