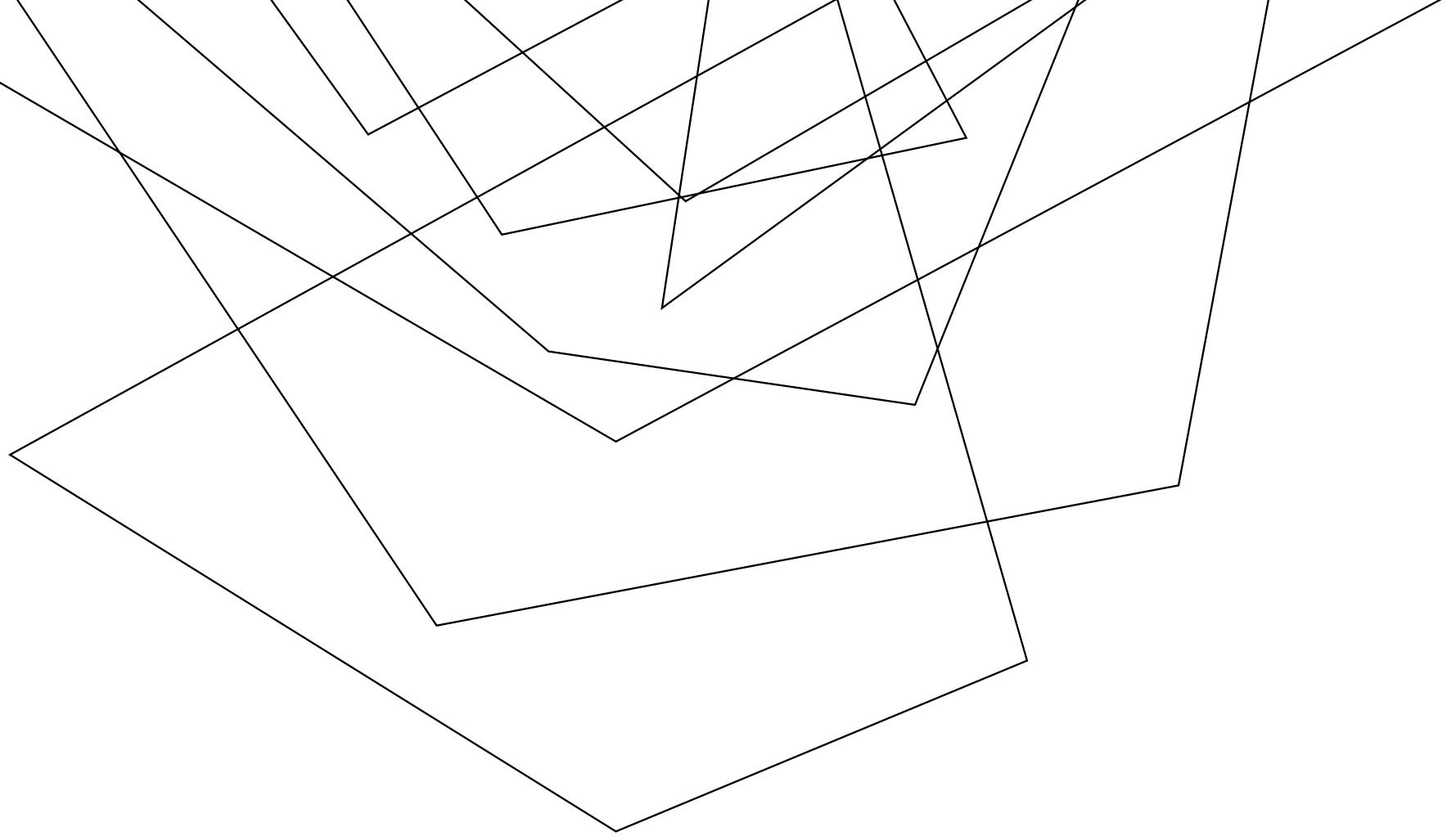


DIGITAL SIGNAL PROCESSING

COE150

SCHEDULE & GRADING

Tuesday and Friday

10:30 – 12:00

QUIZZES – 60%

ACTIVITIES – 40%

COURSE DESCRIPTION

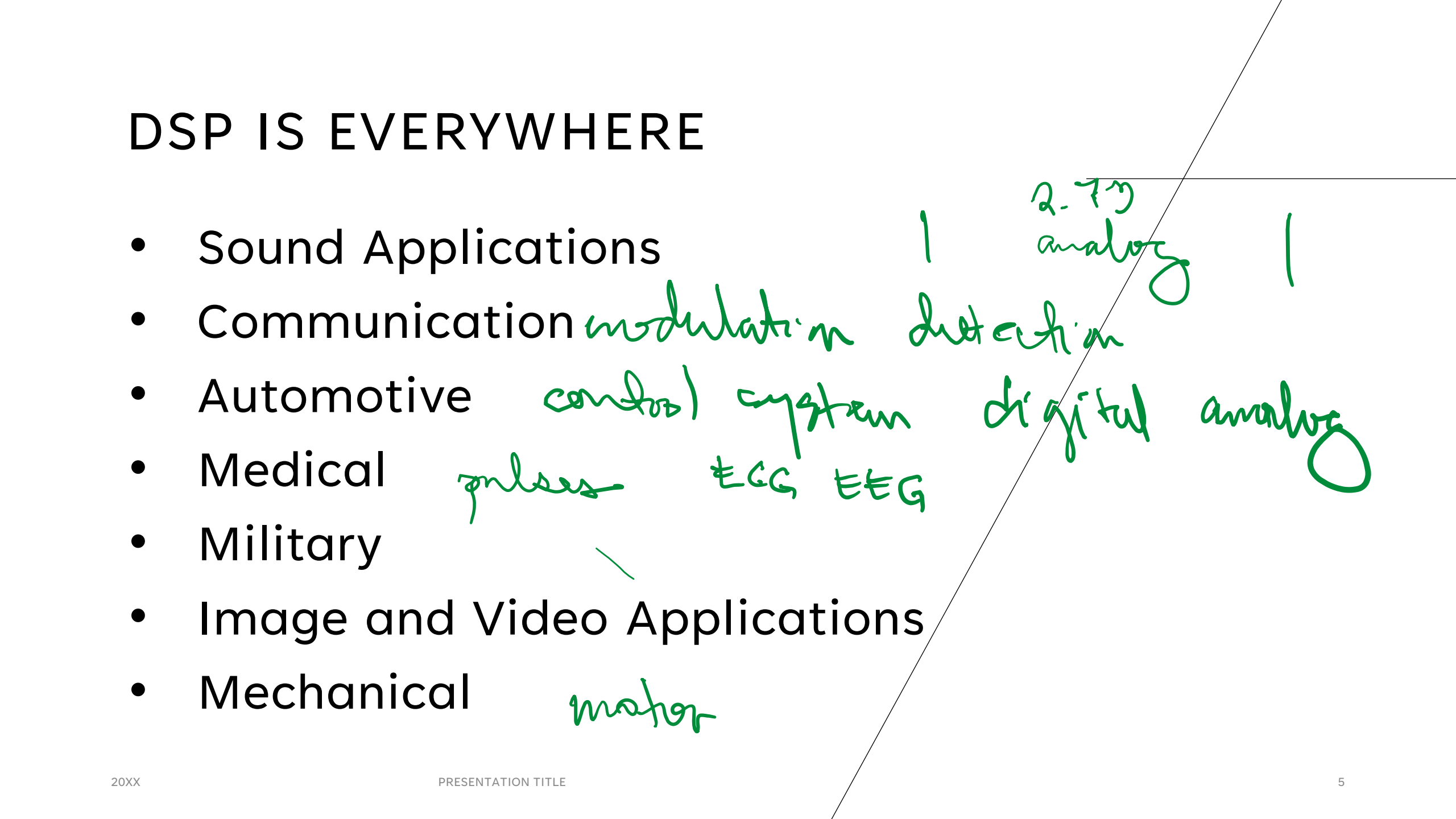
The course includes the need for and tradeoffs made when sampling and quantizing a signal; time-invariant system properties; frequency as an analysis domain complementary to time; and filter design.

DIGITAL SIGNAL PROCESSING

Number of Units for Lecture	3 units
Number of Contact Hours per Week	3 hours per week
Prerequisites	Feedback and Control Systems
Co-requisites	Digital Signal Processing Laboratory
Program Outcomes	To be identified by the program.
Course Outcomes	To be identified by the program.
Course Outline	1. History and Overview 2. Relevant Tools, Standards, and/or Engineering Constraints 3. Convolution 4. Transform Analysis 5. Frequency Response 6. Sampling and Aliasing 7. Digital Spectra and Discrete Transforms 8. Finite and Infinite Impulse Response Filter Design 9. Window Functions 10. Multimedia Processing

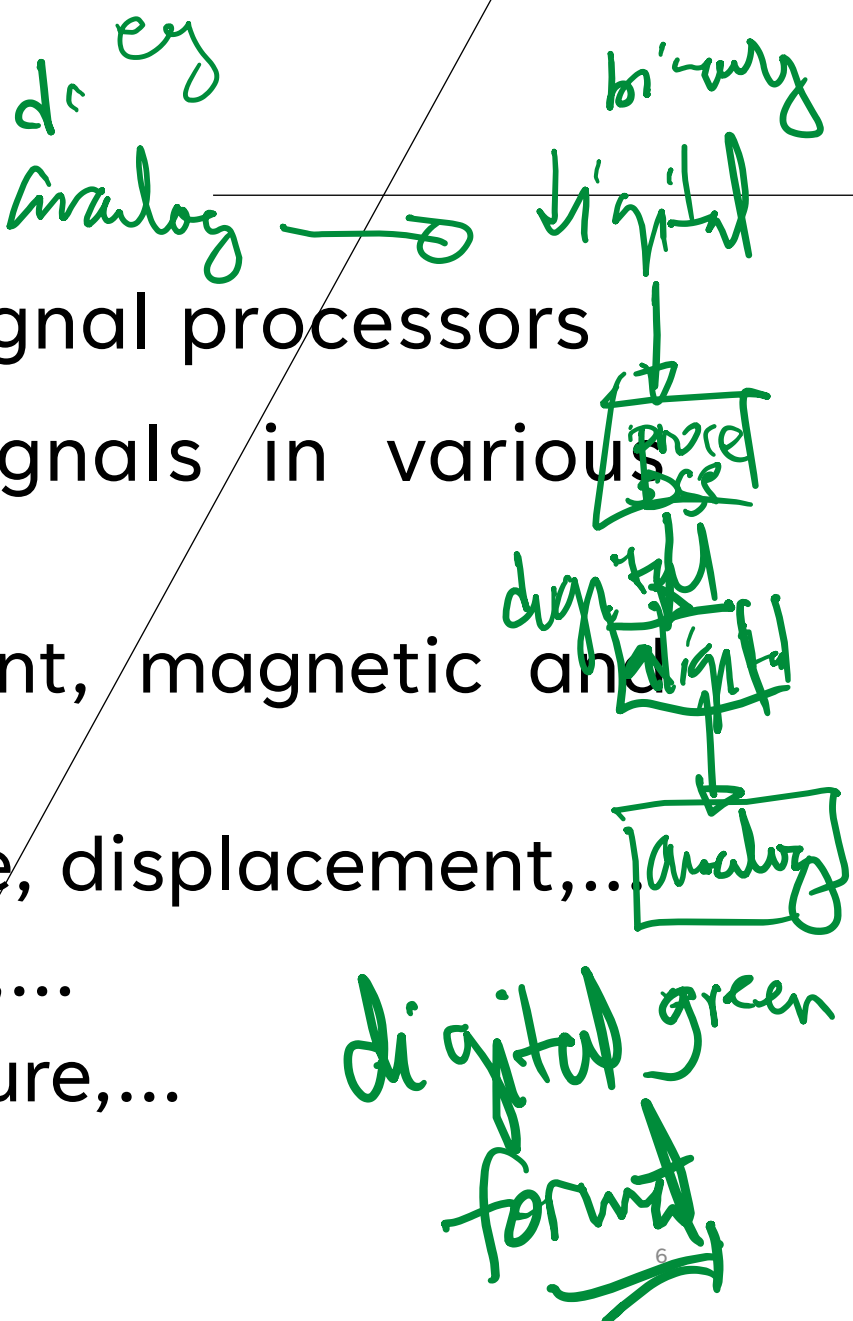
DSP IS EVERYWHERE

- Sound Applications
- Communication
- Automotive
- Medical
- Military
- Image and Video Applications
- Mechanical



SIGNAL PROCESSING

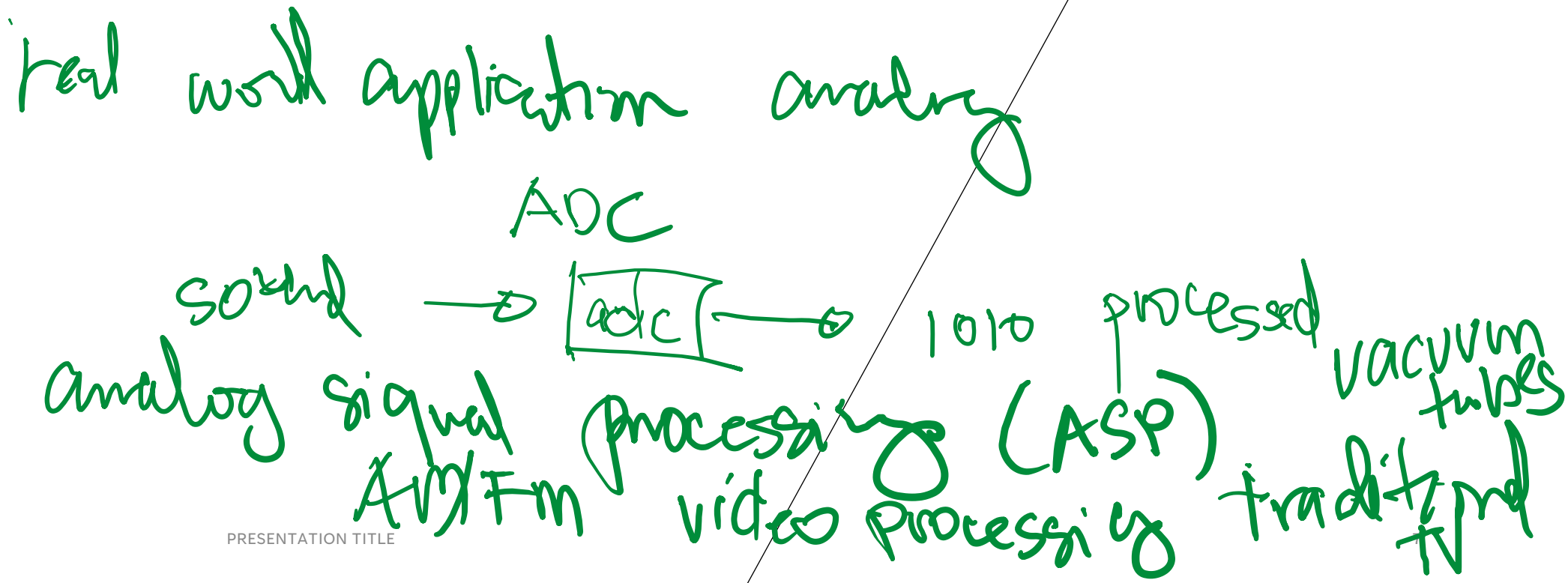
- Humans are the most advanced signal processors
- We encounter many types of signals in various applications
  - **Electrical signals:** voltage, current, magnetic and electric fields,...
  - **Mechanical signals:** velocity, force, displacement,...
  - **Acoustic signals:** sound, vibration,...
  - **Other signals:** pressure, temperature,...



ANALOG SIGNAL PROCESSING

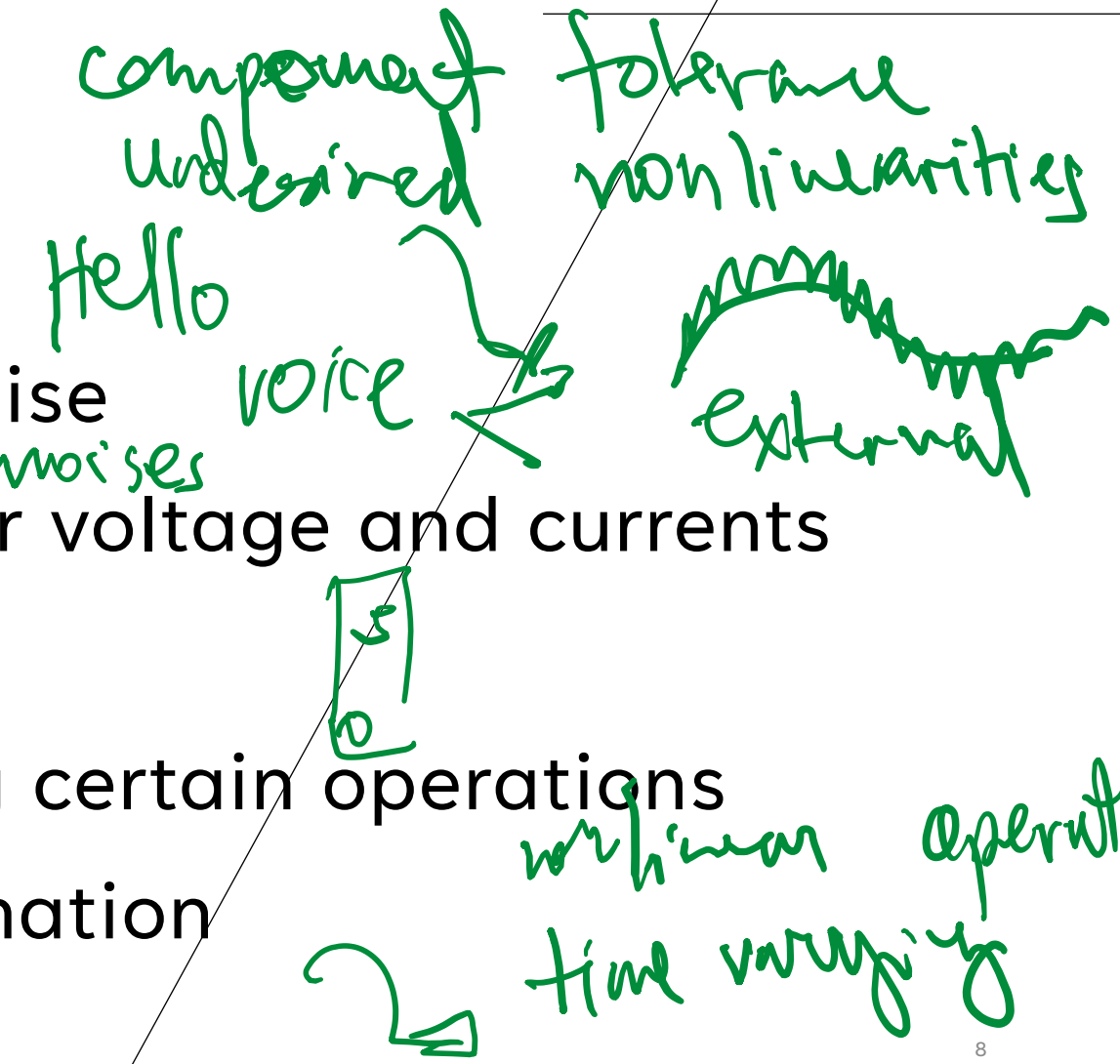
ASP vs DSP

the mathematical operation or analysis of analog signals through analog means.



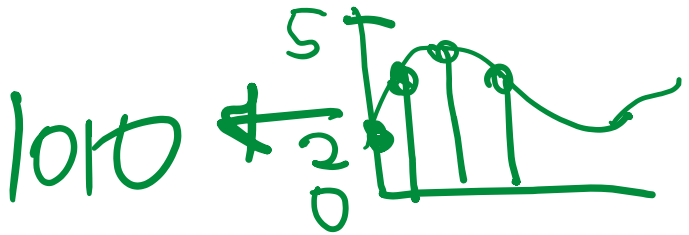
LIMITATIONS OF ASP

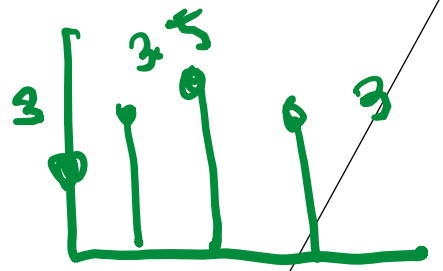
- Accuracy limitations
- Limited repeatability
- Sensitivity to electrical noise
- Limited dynamic range for voltage and currents
- Inflexibility to changes
- Difficulty of implementing certain operations
- Difficulty of storing information

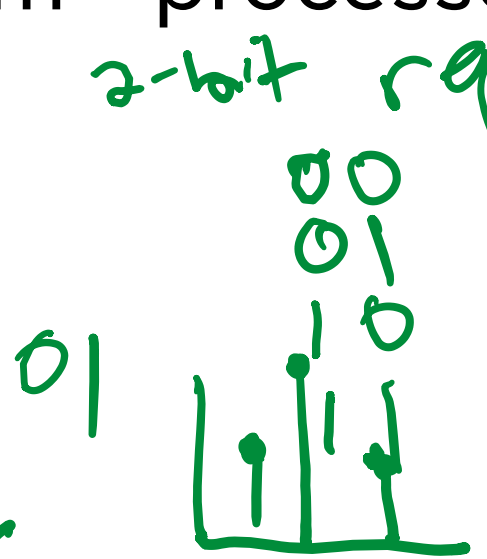


DIGITAL SIGNAL PROCESSING

- Represent signals by a sequence of numbers
- Perform processing on these numbers with a digital processor
- Reconstruct analog signal from processed numbers

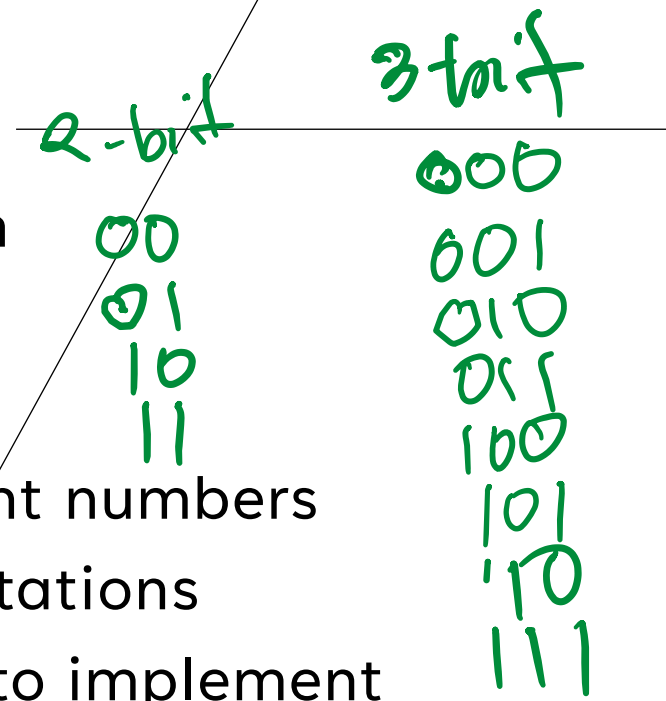


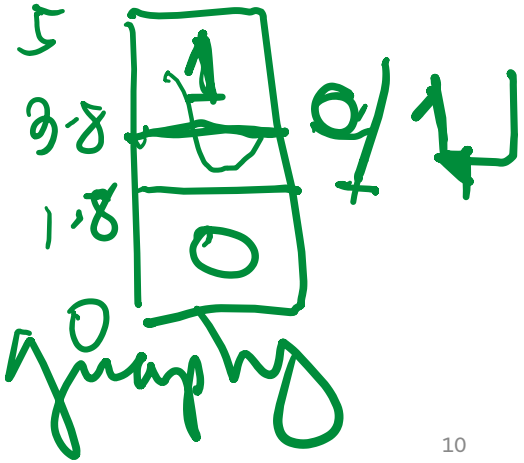




PROS OF DSP

- Accuracy can be controlled by choosing word length
- Repeatable
- Sensitivity to electrical noise is minimal
- Dynamic range can be controlled using floating point numbers
- Flexibility can be achieved with software implementations
- Non-linear and time-varying operations are easier to implement
- Digital storage is cheap
- Digital information can be encrypted for security
- Price/performance and reduced time-to-market





ASP

crypto gaming

CONS OF DSP

Sampling causes loss of information

A/D and D/A requires mixed-signal hardware

Limited speed of processors

Quantization and round-off errors