

SIO 209: Signal Processing for Ocean Sciences

Class 1

Florian Meyer

Scripps Institution of Oceanography
Electrical and Computer Engineering Department
University of California San Diego



UC San Diego
JACOBS SCHOOL OF ENGINEERING

0

Signal Processing for Ocean Sciences

- **Signal Processing Applications:** Entertainment, acoustics, geophysics, space exploration, communications, medicine, and archaeology
- Signal processing algorithms and hardware are prevalent in a wide range of systems from low-cost high-volume consumer electronics to highly specialized military systems
- A goal of this class is to cover advanced signal processing methods that are relevant to ocean science applications
- A detailed syllabus is available online

1

1

Overview

- **Online Platform:** Handouts and homework assignments will be posted on the Canvas calendar
- **Class Schedule:** Lectures are Mondays and Wednesdays 3:30PM – 4:50PM in SPIESS 330.
- **Office Hours:** Office hours are every Friday at 3 PM via Zoom (a link to the Zoom meeting will be posted on the Canvas calendar)
- **Grades:** Homework 30%, midterm project 30%, and final project 40%

2

2

Homework and Research Projects

- **Homework assignments and projects** to be solved in MATLAB will be posted approximately every 1-2 weeks on Canvas and will be due one week later
- Collaborations are encouraged but the developed MATLAB solutions you hand in should reflect your own understanding of the course material
- The assigned **mid-term and final project** should be considered as take-home exams; they should represent individual effort and assistance should not be given nor received from anyone other than the instructor

3

3

Guidelines for Homework and Research Projects

- Style of a technical report or mini conference paper
- Use text editor (Word, Tex, ...) to write the report
- “Tell story” by using plots and add some text to complement the story
- Label all plots, add Figure caption, and mention them in the text
- Report should be well-organized and self-contained
- Plot should always have labels on both axis
- Note that auto-scaling option of MATLAB can give unsatisfying results

4

4

Bibliography

- *Discrete-Time Signal Processing*, Alan V. Oppenheim and Ronald W. Schafer, Prentice Hall, 2009.

Slides based on lecture notes develop by Prof. William S. Hodgkiss and additional references will be posted on the Canvas website of the course

5

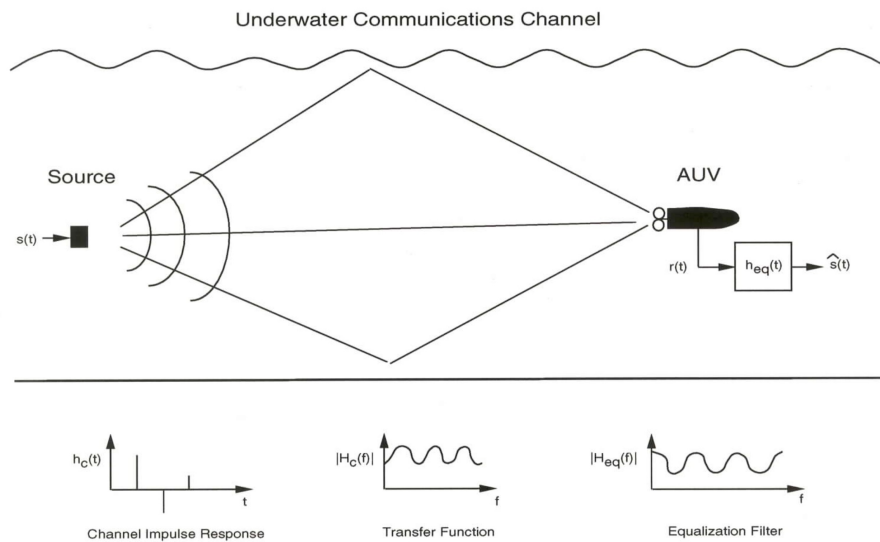
5

Questions?

6

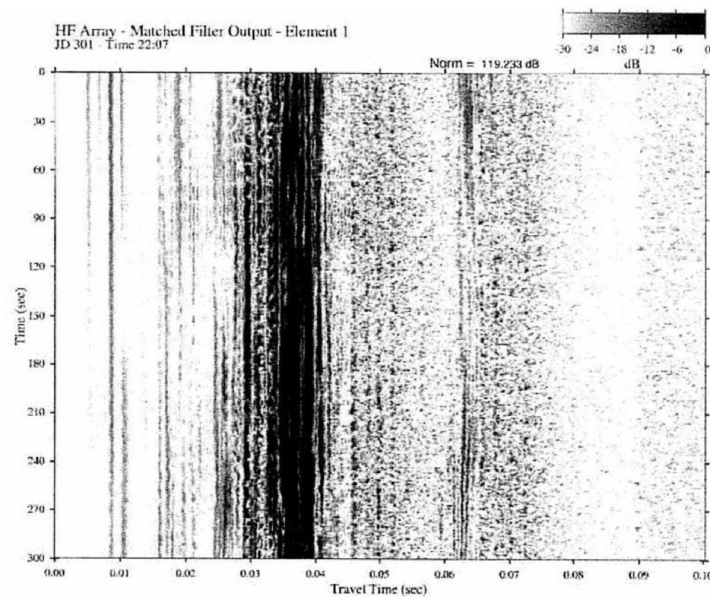
6

Underwater Communication Channel



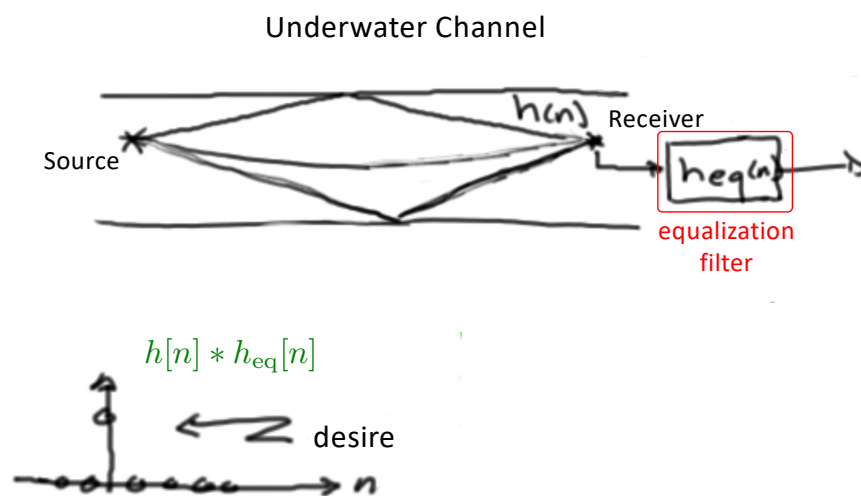
7

Underwater Communication Channel



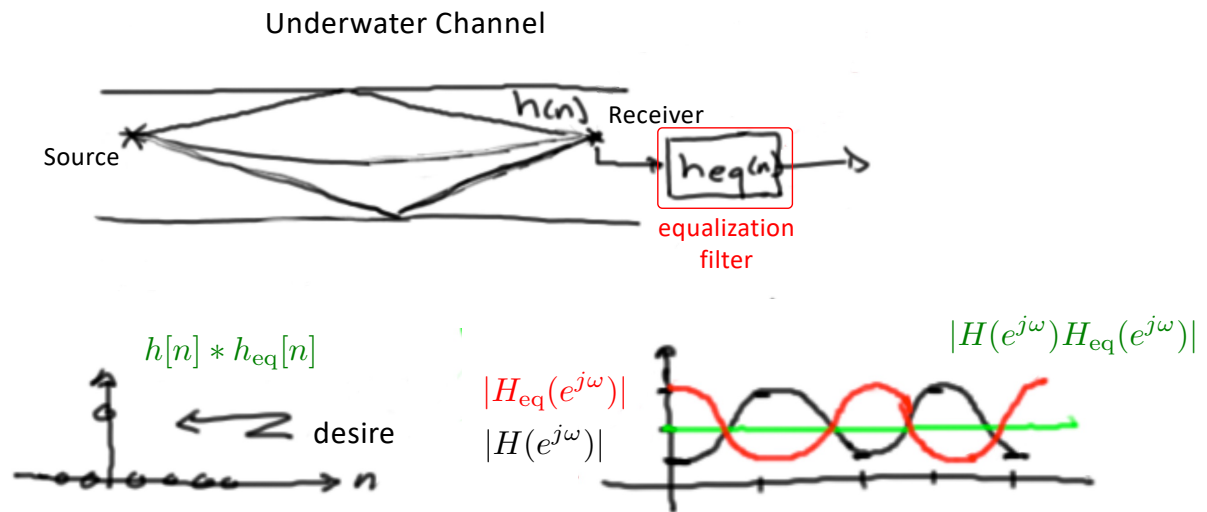
8

Homework 1 – Multipath Propagation



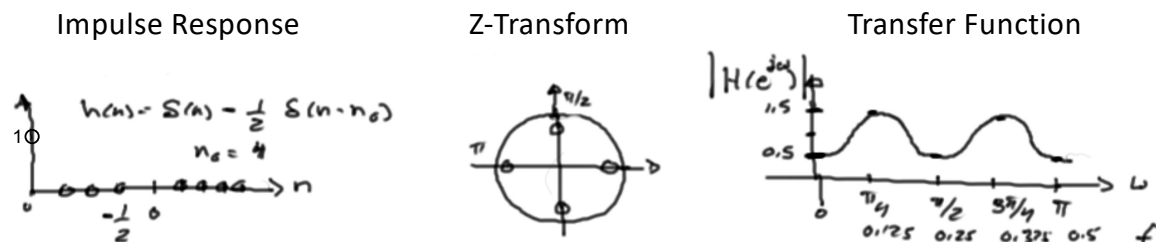
9

Homework 1 – Multipath Propagation



10

Homework 1 – Multipath Propagation

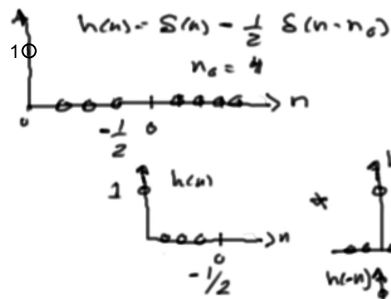


Problem 8.64 in *Oppenheim & Schaffer, 1999*

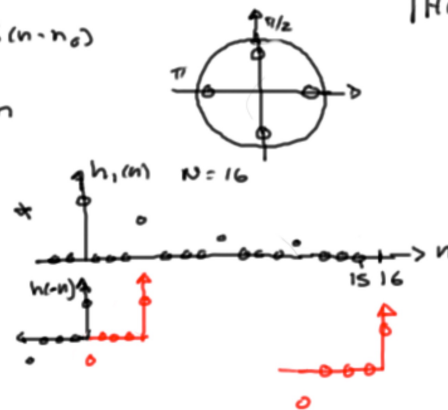
11

Homework 1 – Multipath Propagation

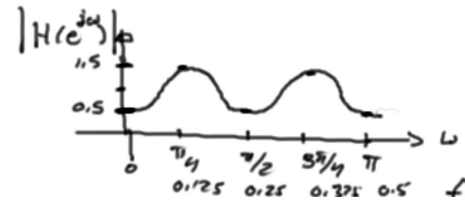
Impulse Response



Z-Transform



Transfer Function

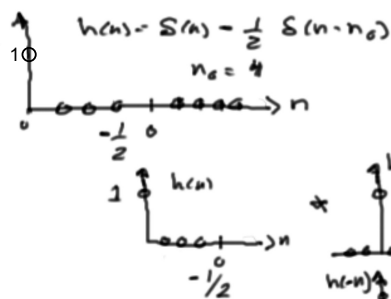


Problem 8.64 in Oppenheim & Schaffer, 1999

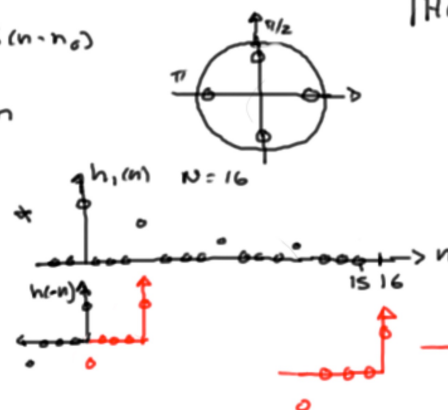
12

Homework 1 – Multipath Propagation

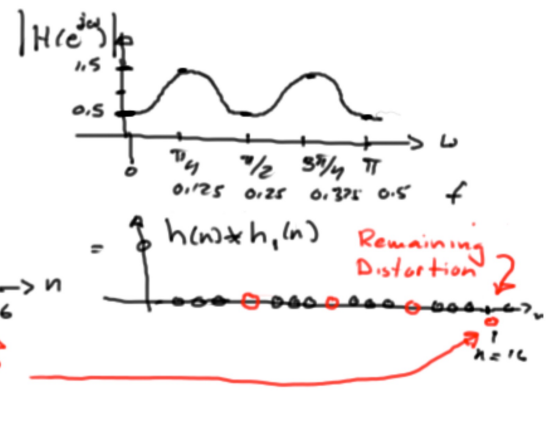
Impulse Response



Z-Transform



Transfer Function

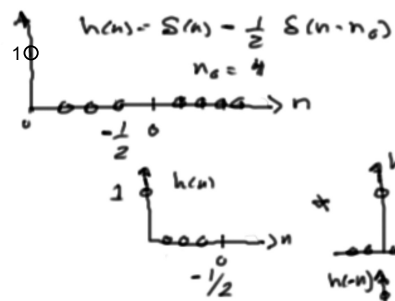


Problem 8.64 in Oppenheim & Schaffer, 1999

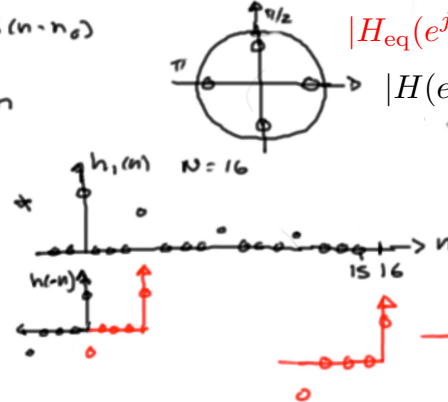
13

Homework 1 – Multipath Propagation

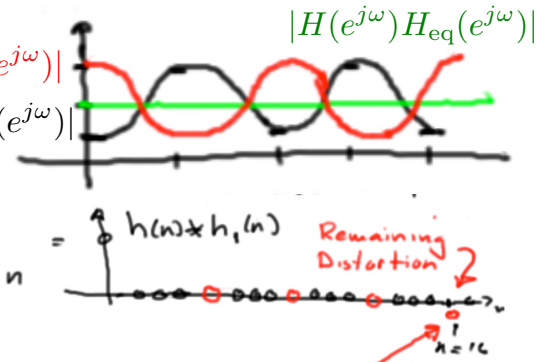
Impulse Response



Z-Transform



Transfer Function



Problem 8.64 in Oppenheim & Schaffer, 1999