

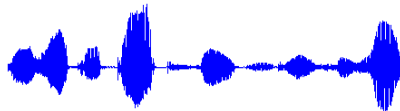
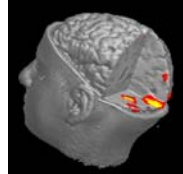
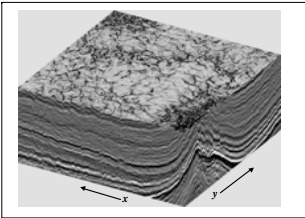
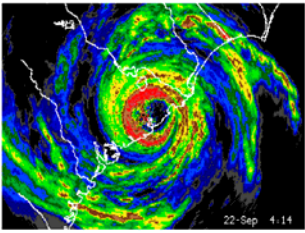


# **An Open Access Educational Repository**

*Richard Baraniuk*  
Rice University

$$c_n = \frac{1}{T} \int_0^T f(t) e^{-i\omega_0 n t} dt$$

**signal  
processing**



$$c_n = \frac{1}{T} \int_0^T f(t) e^{-i\omega_0 n t} dt$$



**signal  
processing**





Bonvin, *Still Life with Book, Papers and Inkwell*, 1876

# motivation – 1999

difficult to **connect** across concepts, courses,  
grades, curricula

- ex: mathematics <> engineering <> technology <> policy
- K <> 12 <> college <> graduate school <> lifelong learning
- curricular stove-piping
- disintegration of ideas

# motivation – 1999

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- ex: mathematics <> engineering <> technology <> policy
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difficult to build **communities, collaborations**  
among experts, faculty, students

- many potential authors shut out
- inefficient: no economies of scale
- glacial time scales of development and updating

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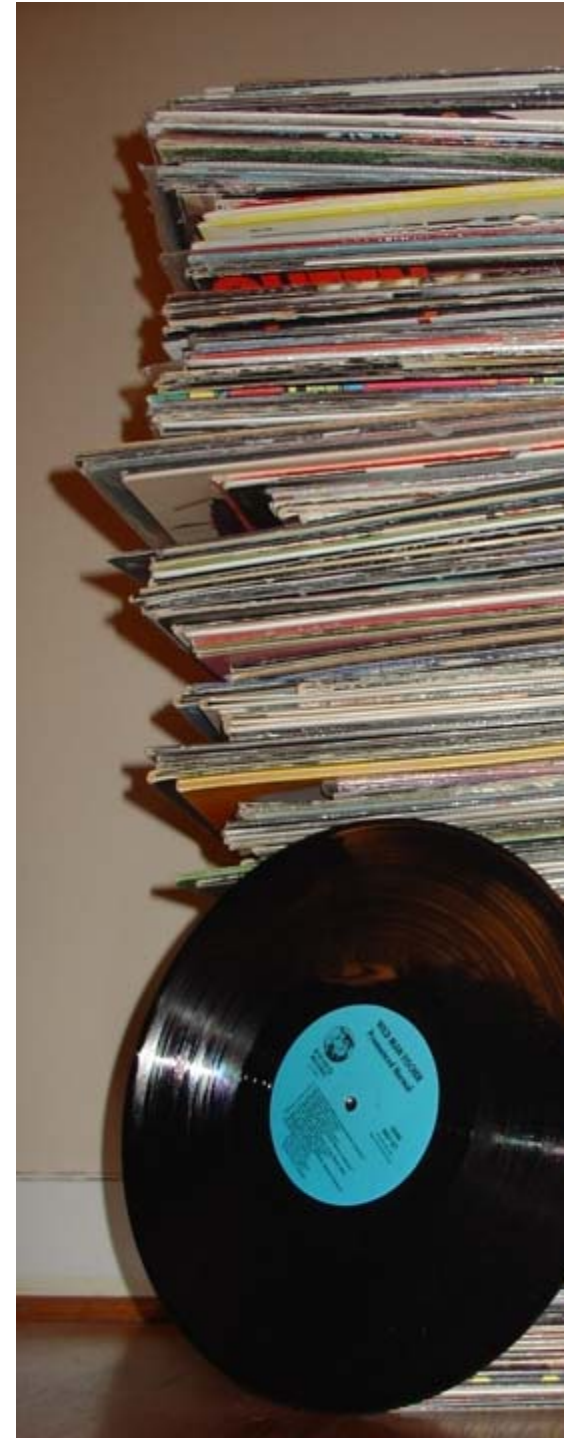
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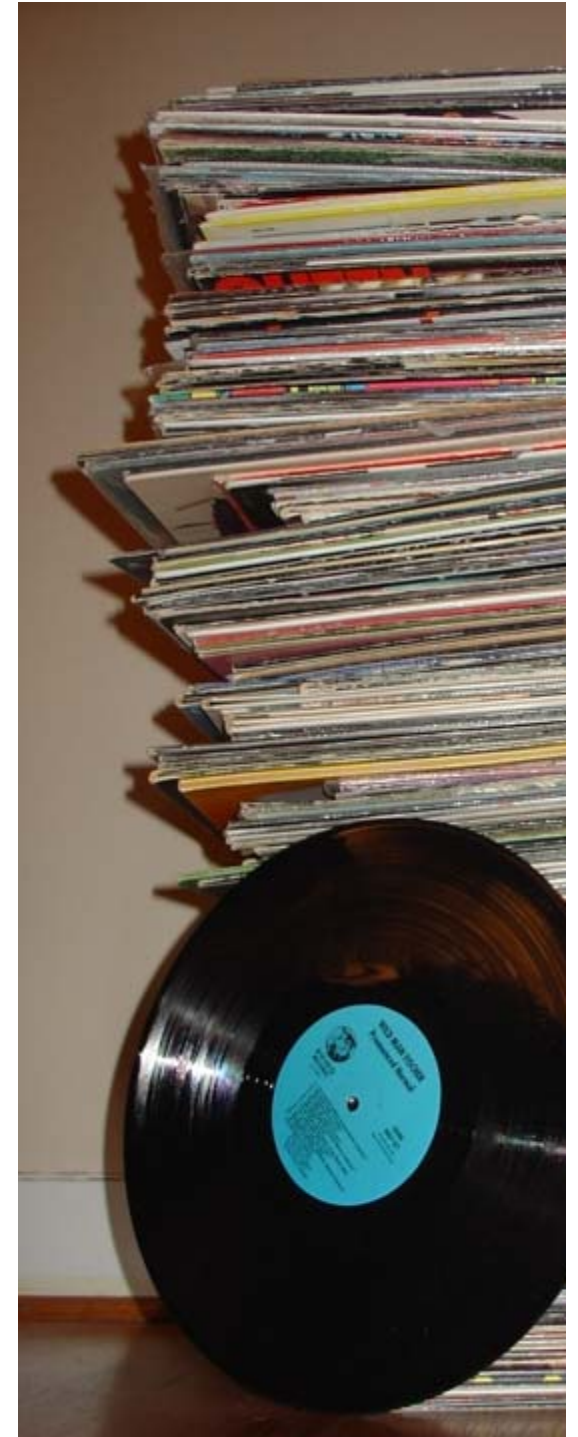






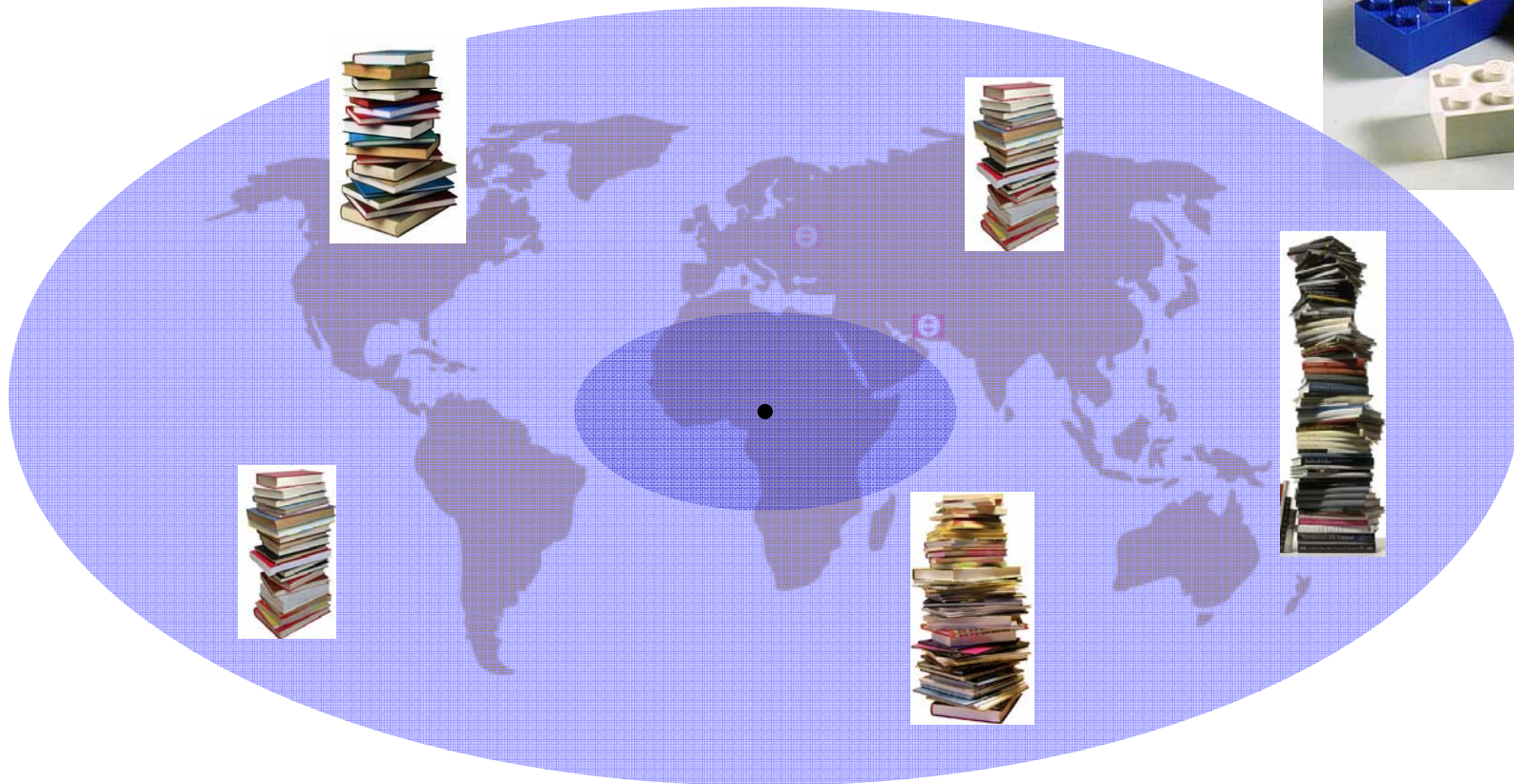
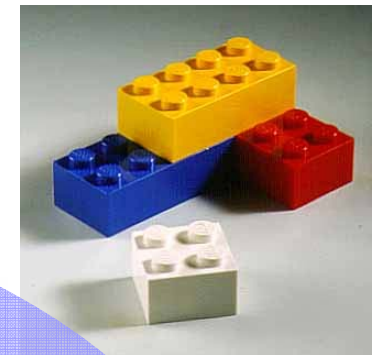
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# 1. liberate course materials

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# Connexions repository



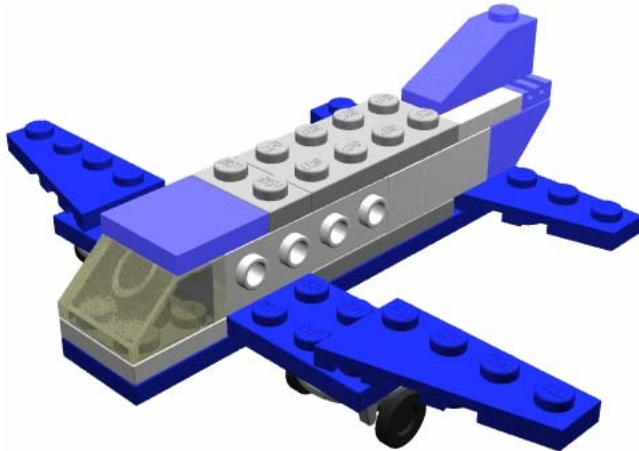
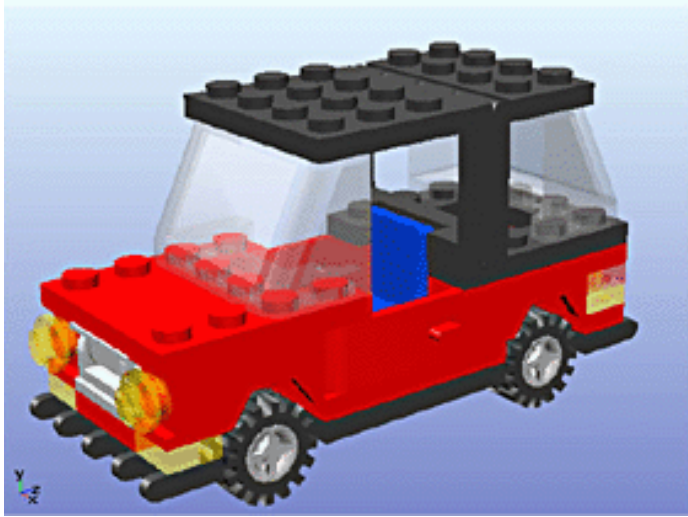
# textbook / course



# personalized courses



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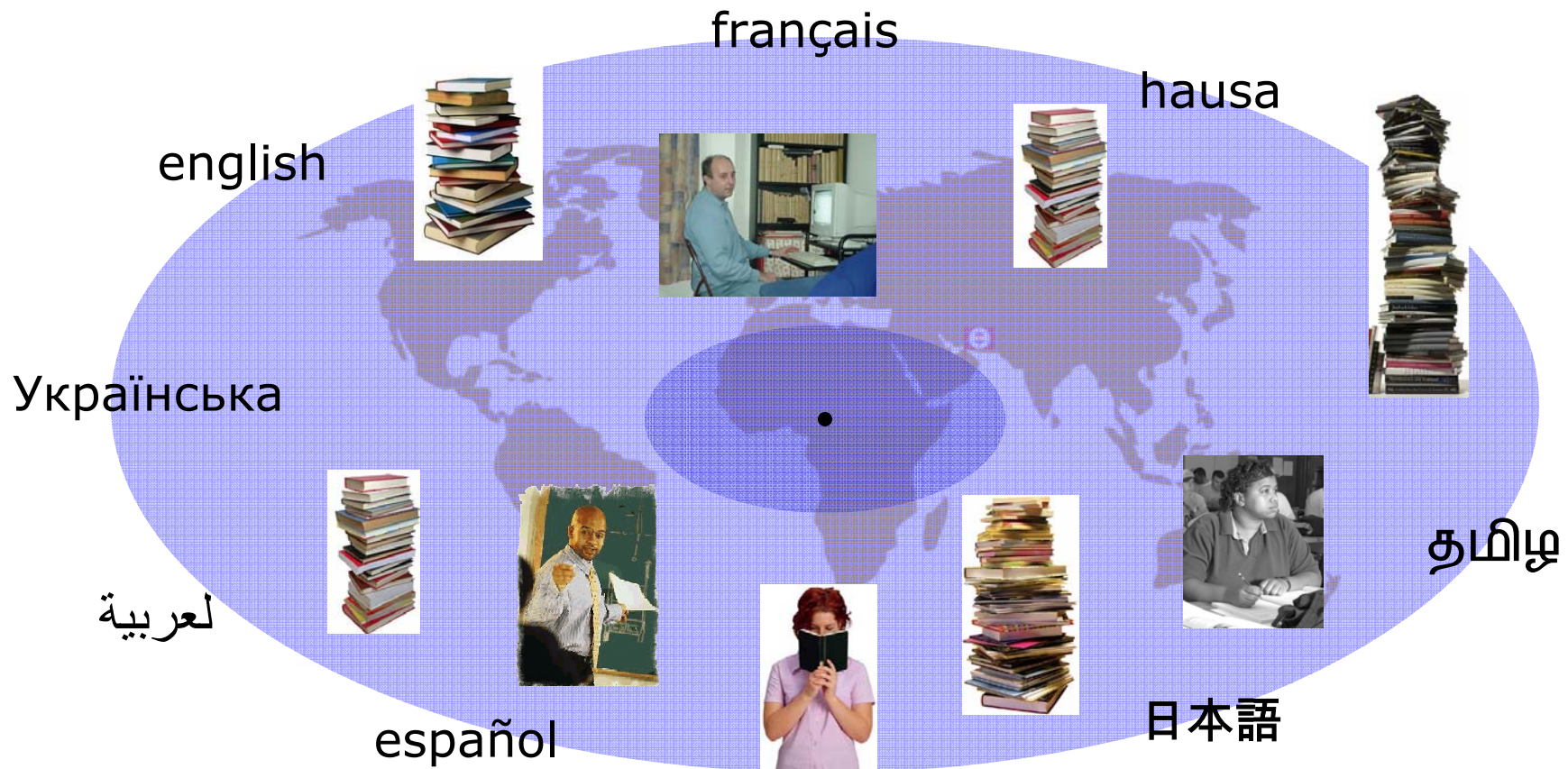


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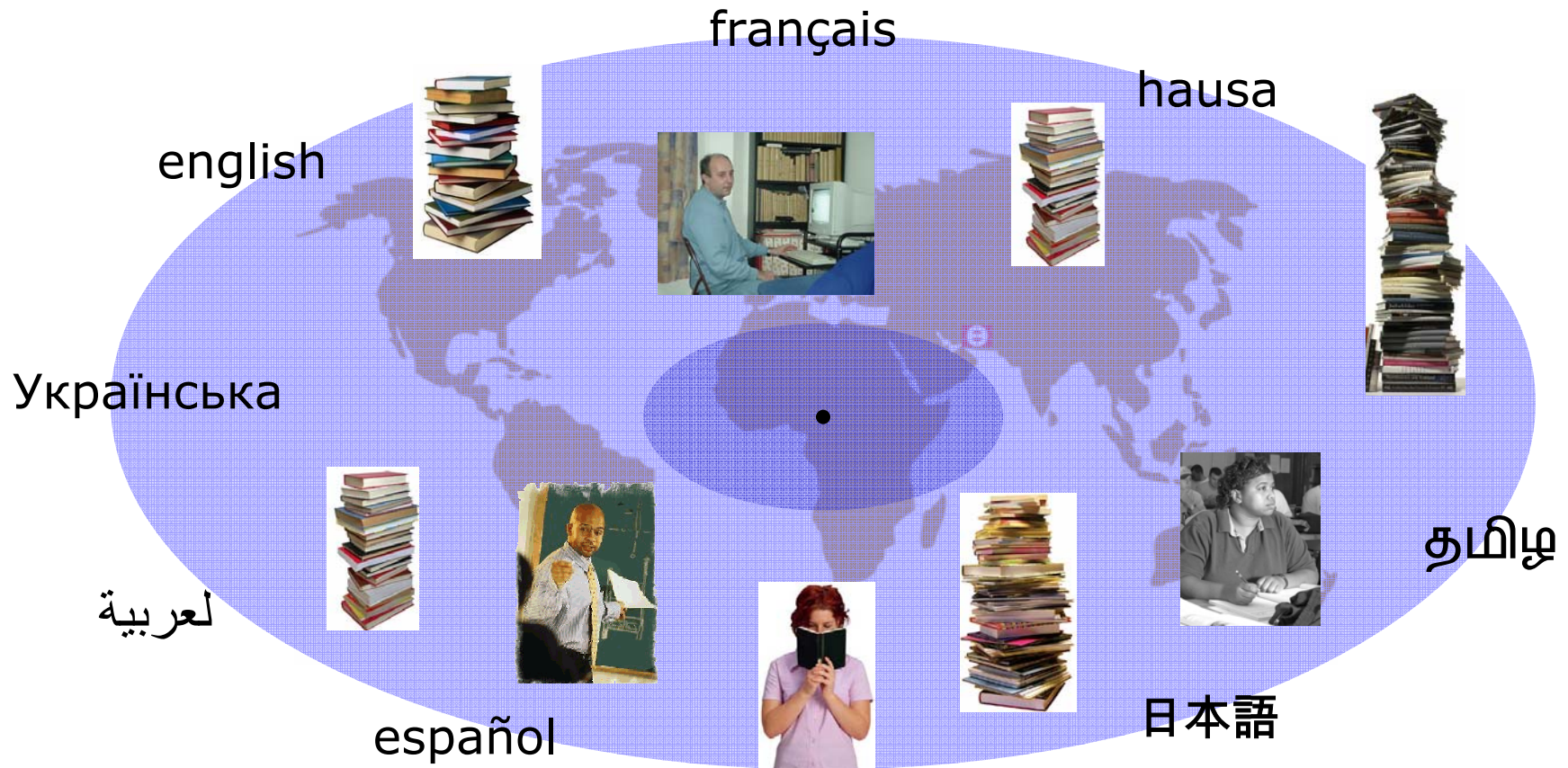
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# Fourier Analysis in Complex Spaces

[Print \(PDF\)](#)

By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

**Summary:** This module derives the Discrete-Time Fourier Series (DTFS), which is a fourier series type expansion for discrete-time, periodic functions. The module also takes some time to review complex sinusoids which will be used as our basis.

## Introduction

By now you should be familiar with the derivation of the [FOURIER SERIES](#) for continuous-time sinusoidal functions. This derivation leads us to the following equations that you should be quite familiar with:

$$f(t) = \sum_n (c_n e^{j\omega_0 n t})$$

$$c_n = \frac{1}{T} \int f(t) e^{-j\omega_0 n t} dt$$

$$= \frac{1}{T} \langle f, e^{j\omega_0 n t} \rangle$$

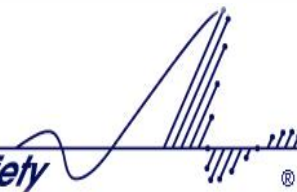


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In this module, we will derive a similar expansion to derive the **Discrete Time Fourier Series**

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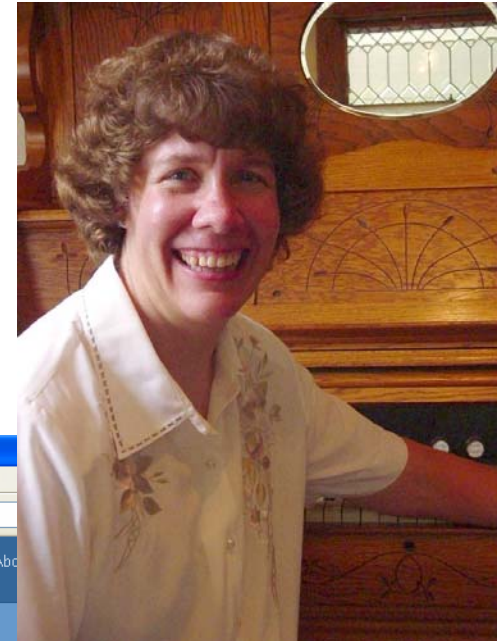
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Catherine Schmidt-Jones

600,000+ page views per month

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but also  
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## Análisis de Fourier en Espacios Complejos

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By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#), [ERIKA JACKSON](#), [FARA MEZA](#)

Based on: [FOURIER ANALYSIS IN COMPLEX SPACES](#) by [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

**Summary:** Este modulo deriva la series de Fourier discreto en el tiempo (DTFS), la cual es un tipo de expansión de fourier para funciones periodicas y discretas en el tiempo. El modulo tambien da un repaso a los senosoidales complejos que sirven como bases.



estar familiarizado con la derivación de la [SERIES DE FOURIER](#) par alas  
Esta derivación nos lleva a las siguientes ecuaciones las cuales usted

$$f(t) = \sum_n (c_n e^{j \omega_0 n t})$$
$$c_n = \frac{1}{T} \int_n f(t) e^{-j \omega_0 n t} dt$$
$$= \frac{1}{T} \langle f, e^{j \omega_0 n t} \rangle$$

Univ. Texas-El Paso



(2)

donde  $c_n$  nos dice la cantidad de frecuencia en  $\omega_0 n$  in  $f(t)$ .

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このテキストは、読むことができます。

期単位で精 期単位で精 処理理論

摘要：该DSP(数字信号处理)教程适合多种相关课程使用，而Connexions则为该教程提供了一个理想的演示平台。

该教程是建立在使用了14年以上的实验指导和历时10年经合作开发的实验讲义基础上的。内容主要来自ELEC320----伊利诺伊大学厄本那 - 香槟分校(the University of Illinois Urbana-Champaign)一门本科四年级两学分的实验选修课。本教程编排结构和教学目的都与其大致相同。本教程适合多种相关课程使用。本教程已在多所大学(如：爱荷华大学(the University of Iowa)、华盛顿大学(the University of Washington)等成功地用于教



的教学安排，包括：  
设计为主(project-oriented)的DSP实验课，  
例的并在每周有实验安排的DSP实验课，



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# Fundamentals of Signal Processing



By: [Minh Do](#)

## Course Content

» Introduction to Fundamentals of Signal Processing

### FOUNDATIONS

- » Signals Represent Information
- » Introduction to Systems
- » Discrete-Time Signals and Systems
- » Linear Time-Invariant Systems



Fundamentals of Signal Processing

Minh Do

## Start Course

**Course Author:** [Minh Do](#)

**Course Description:** Presents fundamental concepts and tools in signal processing including: linear and shift-invariant systems, vector spaces and signal expansions, Fourier transforms, sampling, spectral and time-frequency analyses, digital filtering, z-transform, random signals and processes, Wiener and adaptive filters.

**Contributing Authors:** [Anders Gjendemsjø](#), [Benjamin Fite](#), [Clayton Scott](#), [Don Johnson](#), [Douglas L. Jones](#), [Hyeokho Choi](#), [Ivan Selesnick](#), [Justin Romberg](#), [Melissa Selik](#), [Michael Haag](#), [Minh Do](#), [Ricardo Radaelli-Sanchez](#), [Richard Baraniuk](#), [Rob Nowak](#)

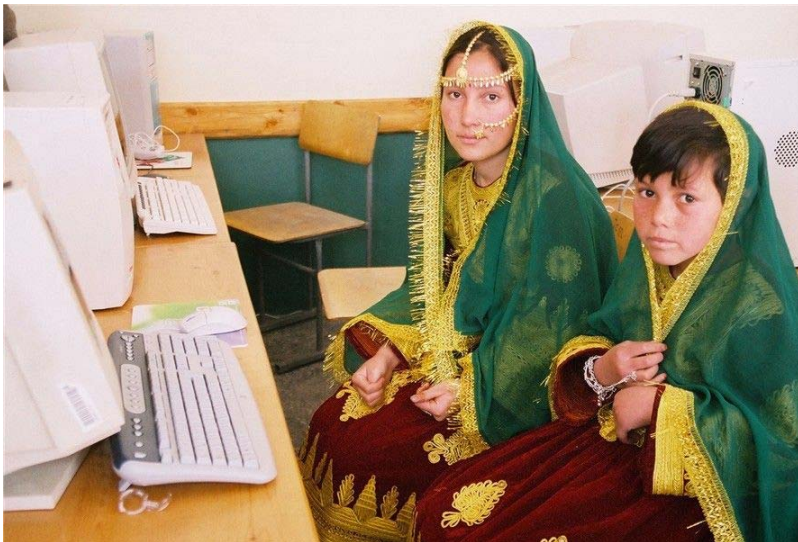
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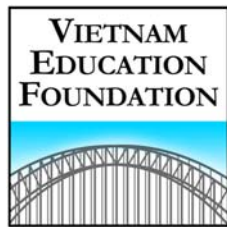
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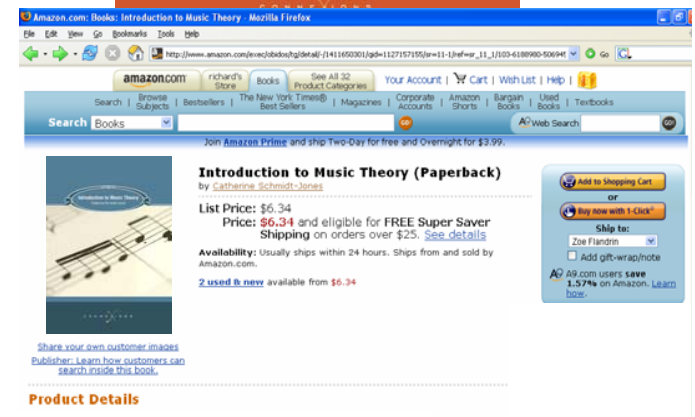
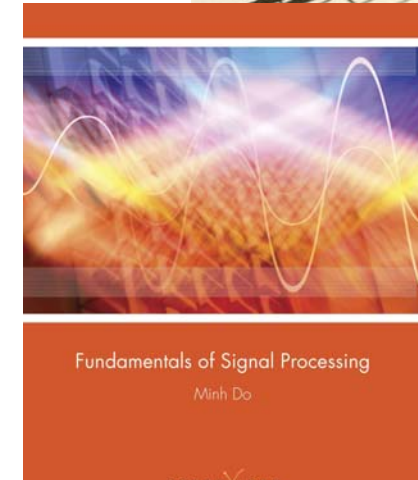
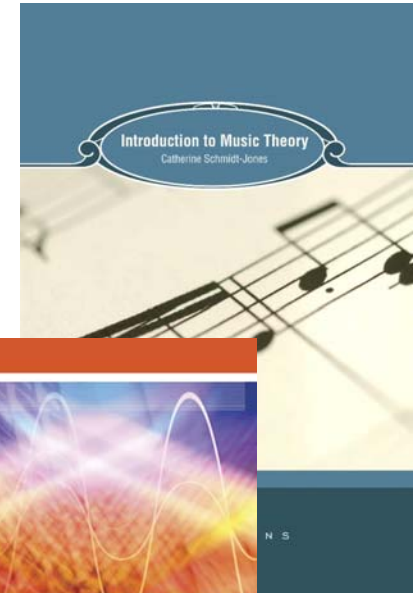
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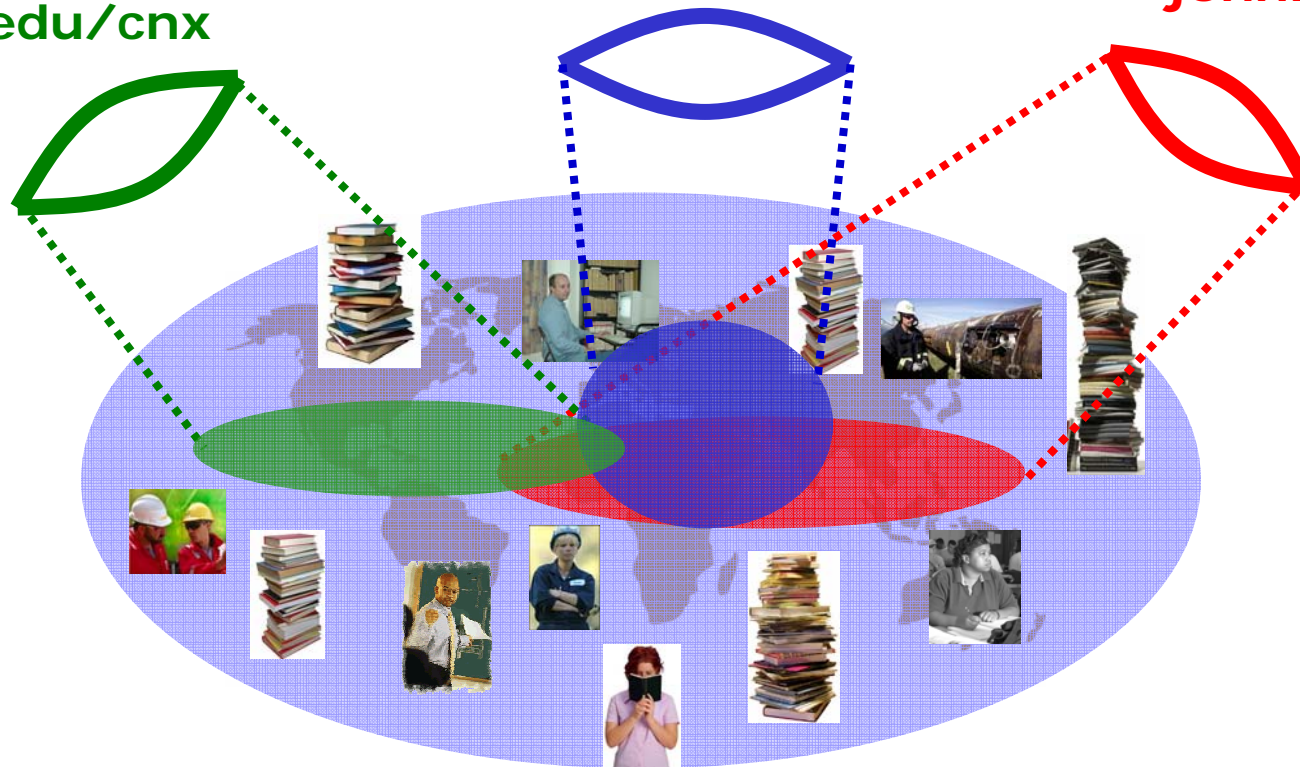
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# initiatives

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# CNX current initiatives

## tools

**XML authoring and conversion tools** (LaTeX, Word, ...)  
course-building, quality control lenses, printing  
distributed and federated repositories (CNX as a *platform*)  
**interactive simulations via XML, content MathML**

## outreach

USA, Latin America, China (OOPS), Japan (TI), Vietnam (VEF)  
North Korea (PUST)

## content projects

K-12 textbooks and teacher materials  
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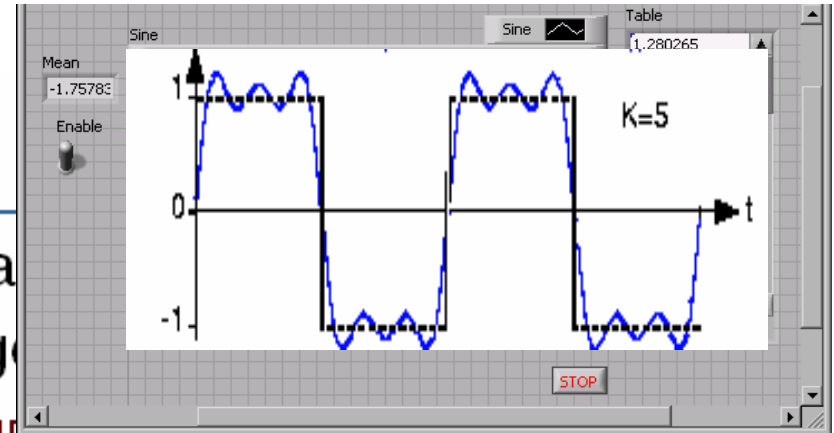
I hear, I forget;  
I see, I remember;  
**I do, I understand**

Confucius

## Coefficients

$f(t)$ , the Fourier coefficients can be calculated by solving for  $c_n$ , which requires a little algebra (for the complete derivation see the [FOURIER'S DERIVATION](#)). The end results will yield the general equation for the Fourier coefficients:

$$c_n = \frac{1}{T} \int_0^T f(t) e^{-i\omega_0 n t} dt$$



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