Animation of dynamic responses in civil engineering

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1310 to 1500, Oct.26, 2022

淡江大學土木系

海洋大學 陳正宗
特聘講座教授

台灣大學 陳正宗
客座教授

成功大學 陳正宗
合聘教授

File name:三校五系合聘教授 by Mei-Na

國立臺灣海洋大學河工系 (1994-2022)

National Taiwan Ocean University
Harbor & River Engineering

Thanks phi tau phi

土木工程學系

斐陶斐講座演講

日期：111/10/26 (星期三)

時間：13:10~14:30

地點：E404

講題：ANIMATION OF DYNAMIC RESPONSES IN CIVIL ENGINEERING

講者：陳正宗 特聘講座教授

國立台灣海洋大學 河海工程學系

主辦單位 工學院土木工程學系

斐陶斐榮譽學會（Phi-Tau-Phi）

- Founded 1921（民國十年五月二十五日）
- Phi 斐　　Tau 陶　　Phi 斐

哲學 Philosophia ↓　工學 Technologia ↓　理學 Physiologia

- 宗旨:獎勵學術研究，崇德敬業，選賢勵學，崇敬德業

學會創始人
愛樂斯先生
天津北洋大學結構工程系任教

現任理事長
台科大校長顏家鈺博士

現任理事
海大校長許泰文博士

現任理事
台大校長管中閔博士

榮譽會員
陳正宗 特聘講座教授

Mechanics Sound Laboratory Vibration

與 Phi-Tau-Phi 在淡江大學結緣 since 1986

1986

台大應力所

Phi Tau Phi


中華民國斐陶斐榮譽學會
榮譽會員證書

The Phi Tau Phi Scholastic Honor Society of The Republic of China

National Taiwan Ocean University

張建邦校長（理事長）
全員聚餐（淡江大學城中校區）

Phi Tau Phi 榮譽會員演講數學力學與計算-陳正宗特聘講座教授(2014-2021)

	申請人	承辦人	服務對象	學會會址
2014海大	李應德	楊政霖	海大河工系	台灣大學
2015海大	周昭昌	王馨霙	海大機械系	義守大學
2016海大	陳柏台	吳仰凱	海大系工系	義守大學
2017 海大	張文哲	廖嘉慧	海大全體	政治大學
2017 淡江	洪勇善	李家瑋	淡江土木系	政治大學
2018 淡江	洪勇善	李家瑋	淡江土木系	政治大學
2018 海大	郭世榮	廖嘉慧	河工概論	政治大學
2018 義守	黃宏財	黃宏財	TWBEM 9 (義守)	政治大學
2019海大	蕭松山	廖嘉慧	海工科技導Oct3	輔仁大學
2019淡江	張正興	李家瑋	淡江土木系Oct29	輔仁大學
2019成大	林裕城	劉立偉	TWBEM10 NOV2	輔仁大學
2020海大	陳泰安	廖秘書	海大河工概論	清華大學
2021海大 1101	任貽明	許絜涵	海大機械A館	清華大學
2021台大 1108	陳國慶	許文珍	台大應力所	清華大學
2021中央 1116	陳世晃	李顯智	中央土木系	清華大學
2021成大 1119	吳建宏	柯永彥	成大土木系	清華大學

NTOU/MSV Phi Tau Phi 台海淡分享會 (2022)

地點		申請人	承辦人	服務對象	學會會址
	2022海大 0930	方志中	吳仰凱	海大造船	台科大
	2022淡江 1026	李家瑋	楊長義	淡江土木	台科大
	2022台大 1108	張國鎮	劉立偉	台大土木	台科大

檔名：NTOUMSV Phi Tau Phi 月 央台海成分享會 (Nov, 2021) TL製表

Outline

1. Introduction of TwSIAM and ACMT
2. Animation of dynamic responses
3. Convolution and deconvolution

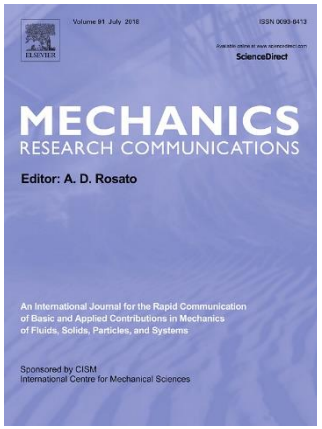
Part I
Introduction of TwSIAM

- Establish: non-profit academic society established on June 26, 2012
- Aim:
  - To promote research and education of applied mathematics
  - To bridge mathematics and industry communities
- Members (2018):
  - Regular members: 102
  - Group members: 16
  - Student members: 53
- Web address: www.twsiam.org

Part I
Introduction of ACMT

Part II-1: Damping
Animation of dynamic response

走過阻尼模式二十七年 (1994-2022)



Mech. Res. Commun.

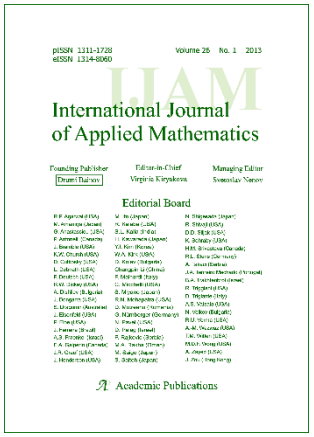
Chen *et al.* (1994)

Crandall (1995)

Adv. Eng. Softw.

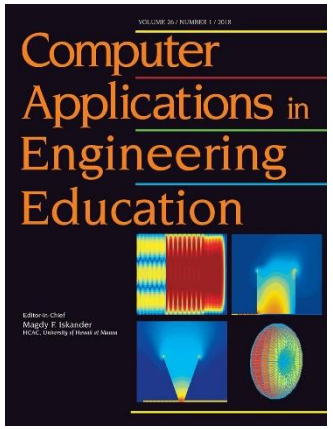
Chen *et al.* (1997)

Chen *et al.* (1999)



Int. J. Appl. Math.

Kuo *et al.* (1999)

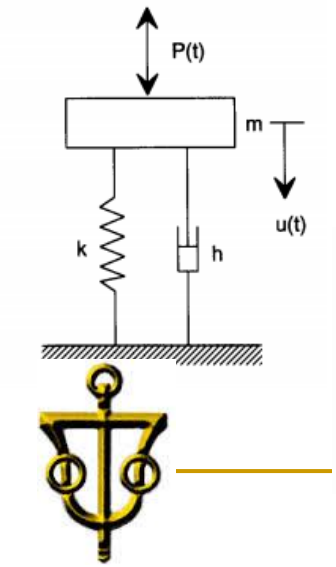


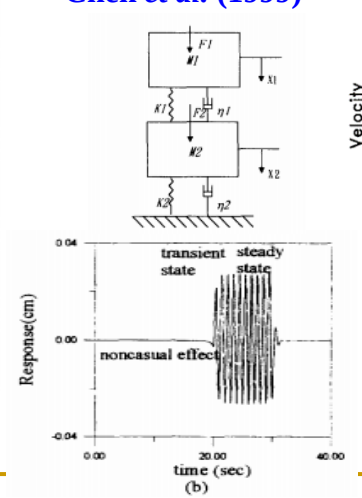
Comput. Appl. Eng. Educ.

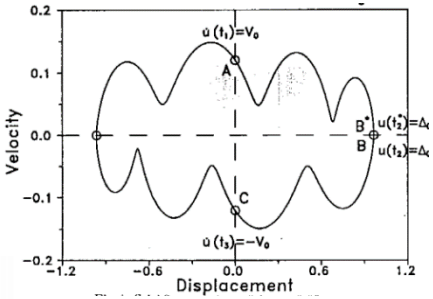
Chen *et al.* (1999)

J. Eng. Mech.-ASCE

Chen *et al.* (2018)







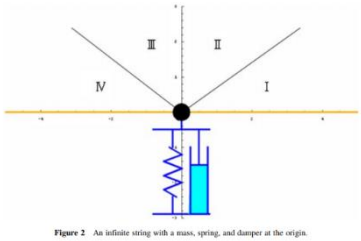
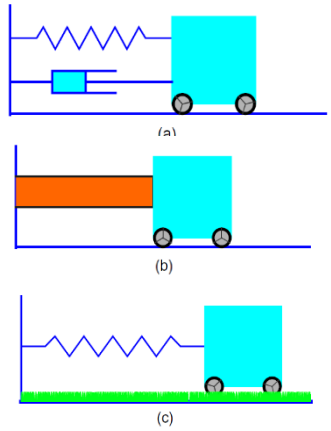


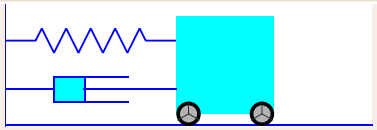
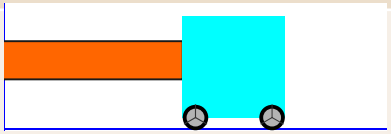
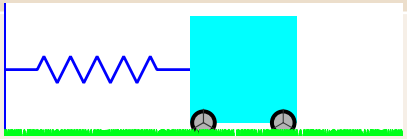
Figure 2 An infinite string with a mass, spring, and damper at the origin.



Hysteretic damping

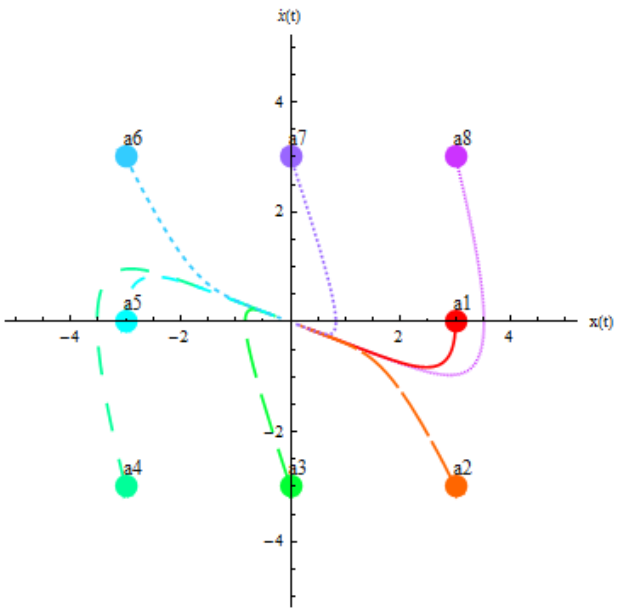
New Hysteretic damping

Animations and Properties of Three SDOF Damping Systems (ASCE-EM, 2018)

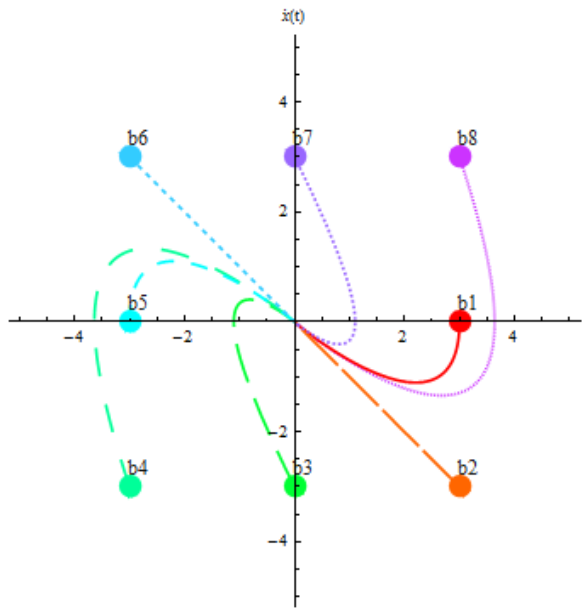
	Viscous damping	New hysteretic damping (Chen, 1995)	Coulomb damping (V. Ph. Zhuravlev, 2013)
Governing equation	$\ddot{x}(t)+2\xi\omega_n\dot{x}(t)+\omega_n^2 x(t)=0$	$\ddot{x}(t)+\eta\omega_n^2\frac{\lvert x(t)\rvert}{\lvert\dot{x}(t)\rvert}\dot{x}(t)+\omega_n^2 x(t)=0$	$\ddot{x}(t)+\omega_n^2 x(t)=F_d$, $F_d=\begin{cases}-a\omega_n^2, & \dot{x}(t)>0,\\ a\omega_n^2, & \dot{x}(t)<0,\end{cases}$
Mechanical systems			
Damped frequency	$\omega_v=\omega_n\sqrt{\lvert 1-\xi^2\rvert}$	$\omega_{h1}=\omega_n\sqrt{1+\eta}$, in the 1st and 3rd quadrants $\omega_{h2}=\omega_n\sqrt{\lvert 1-\eta\rvert}$, in the 2nd and 4th quadrants	ω_n
Dimension less damped period	$\frac{T_v}{T_n}=\frac{2\pi/\omega_v}{2\pi/\omega_n}=\frac{1}{\sqrt{1-\xi^2}}$	$\frac{T_h}{T_n}=\frac{\sqrt{1+\eta}+\sqrt{1-\eta}}{2\sqrt{1-\eta^2}}$	$\frac{T_c}{T_n}=1$
Amplitude decay	$R_v=\frac{A_{k+1}^v}{A_k^v}$ $=e^{-2\xi\pi/\sqrt{1-\xi^2}}$, $k=0,1,2,\ldots,\ \xi<1$ exponential decay	$R_h=\frac{A_{k+1}^h}{A_k^h}$ $=\frac{1-\eta}{1+\eta}$, $k=0,1,2,\ldots,\ \eta<1$ geometric decay	$D_c=A_{k+1}^c-A_k^c$ $=-4a$, $k=0,1,2,\ldots$ linear decay

Viscous damping model

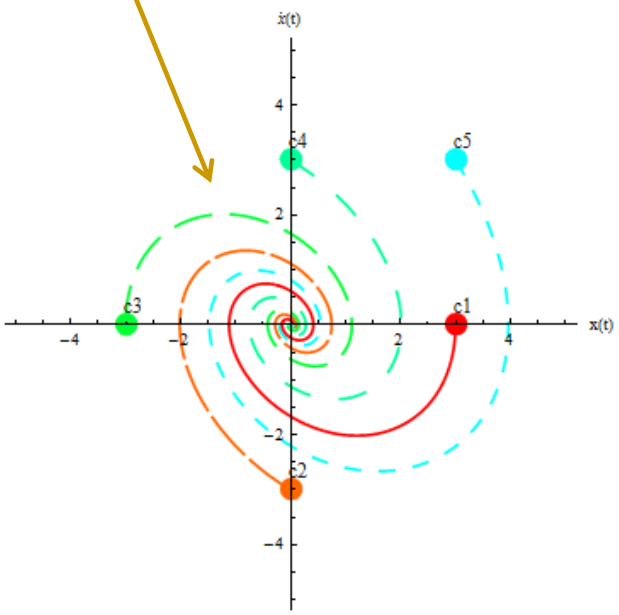
spiral trajectories



$\xi = 1.5\ (\xi > 1)$



$\xi = 1$



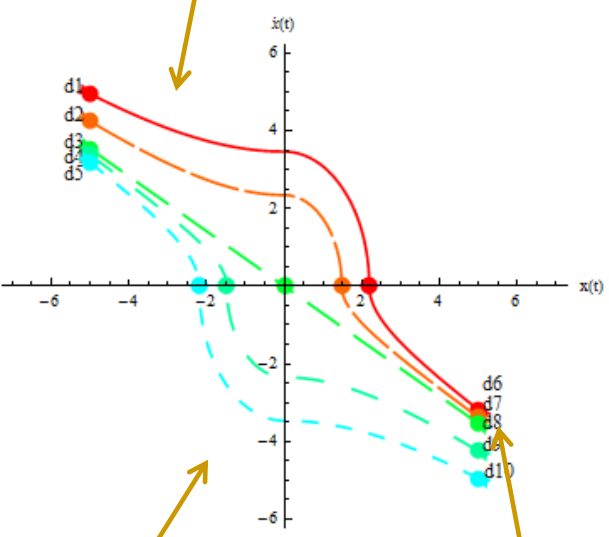
$\xi = 0.3\ (\xi < 1)$

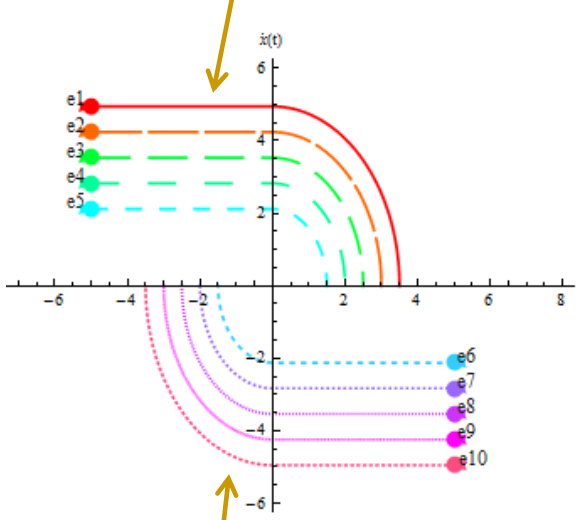
New hysteretic damping model

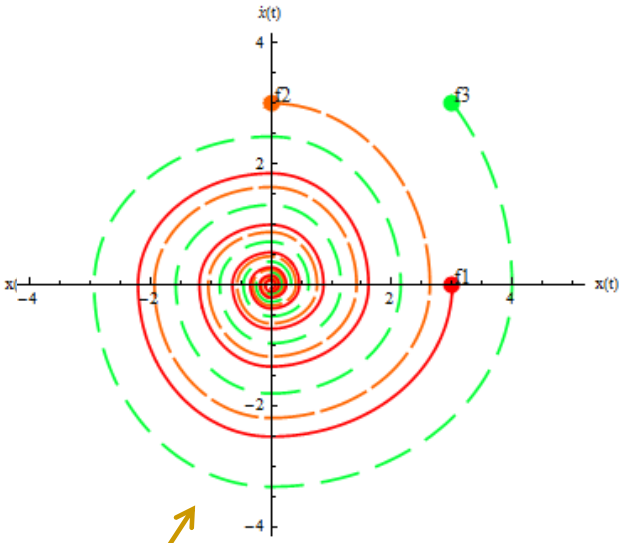
Hyperbolic curves in the 2nd and 4th quadrants

Horizontal line in the 2nd and 4th quadrants

stiffer spring $k = 1 + \eta$ in the 1st and 3rd quadrants
softer spring $k = 1 - \eta$ in the 2nd and 4th quadrants







Elliptical curves in the 1st and 3rd quadrants

Straight line (initial state locates on the asymptotic line)

Elliptical curves in the 1st and 3rd quadrants

Trajectories combining four quarter-ellipses

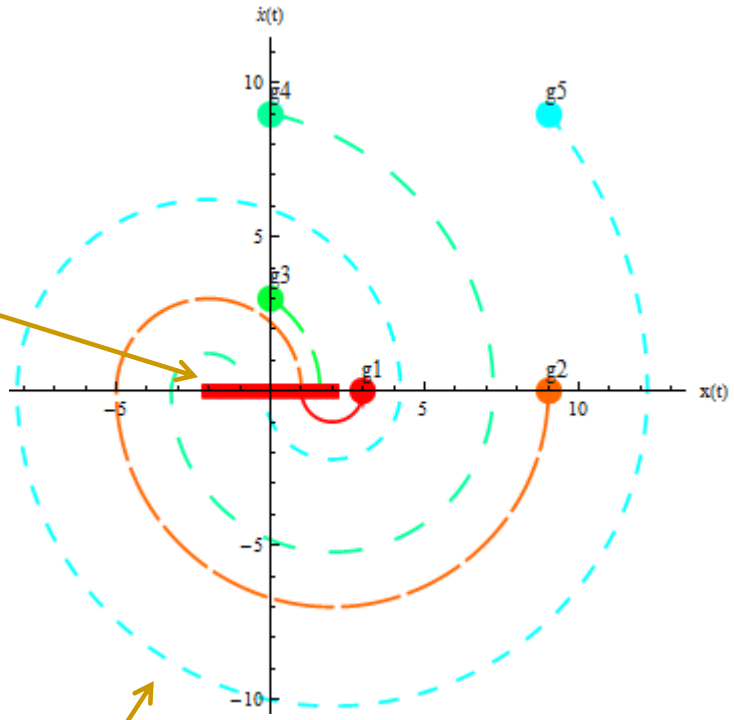
$\eta = 1.5\ (\eta > 1)$

$\eta = 1$

$\eta = 0.3\ (\eta < 1)$

Coulomb damping model

All body finally rests in the dead zone owing to the friction force

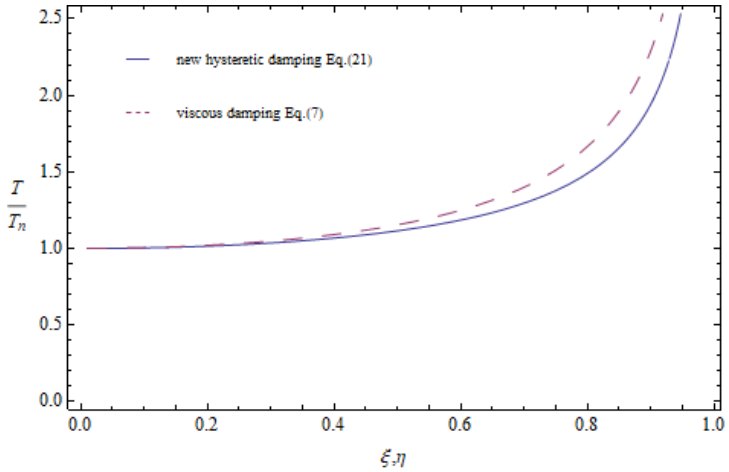


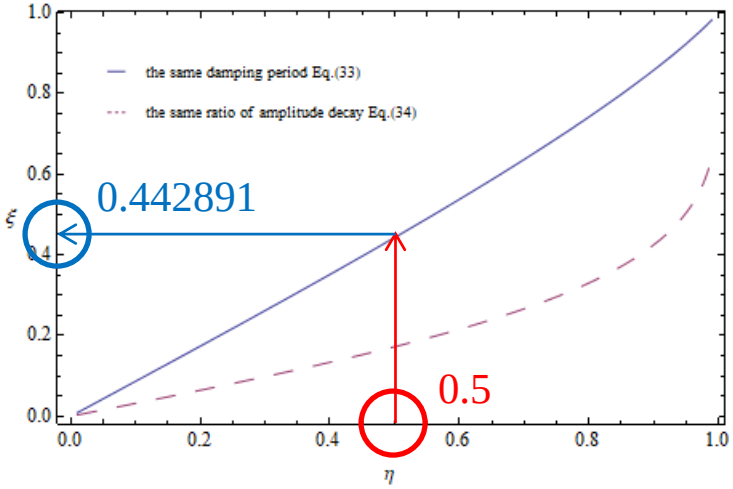
Trajectories combining two half elliptical curves

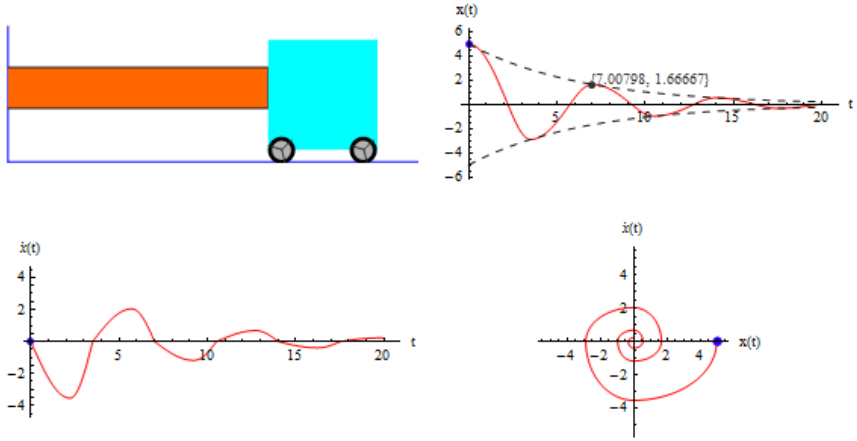
$a = 2$

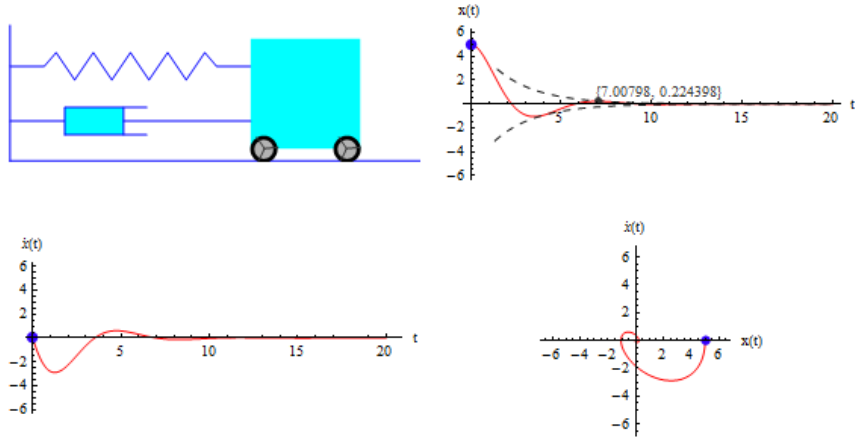
The same damping period between viscous damping model & new hysteretic damping model

$$\xi = \sqrt{1-\left(\frac{2\sqrt{1-\eta^2}}{\sqrt{1+\eta}+\sqrt{1-\eta}}\right)^2}\,,\ \text{for the same damping period}$$



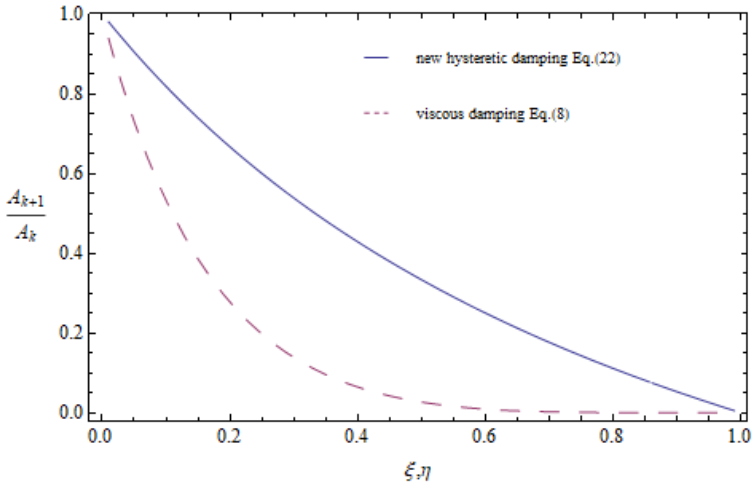


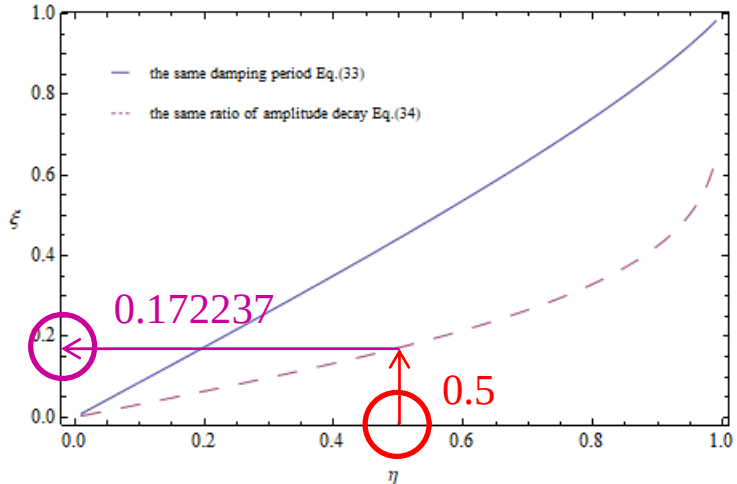


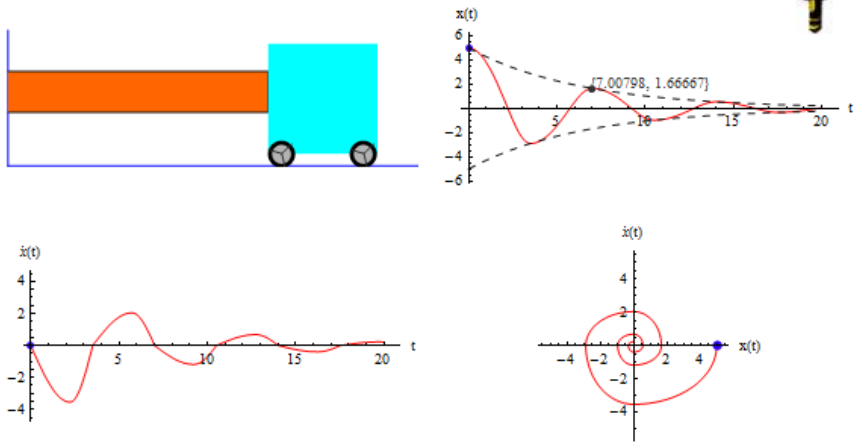


The same ratio of amplitude decay between the viscous damping model & new hysteretic damping model

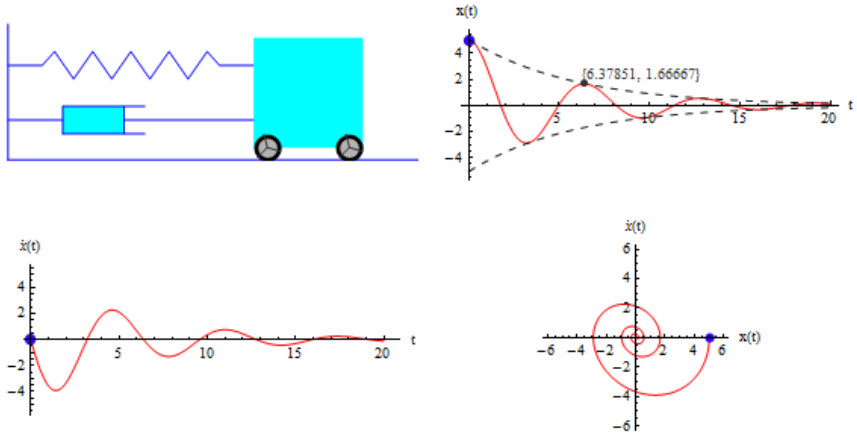
$$\xi = \sqrt{\frac{\left(\ln\left(\frac{1-\eta}{1+\eta}\right)\right)^2}{\left(\ln\left(\frac{1-\eta}{1+\eta}\right)\right)^2 + 4\pi^2}}$$, for the same ratio of amplitude decay.







$\eta = 0.5$

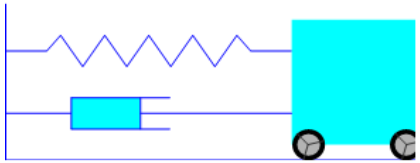


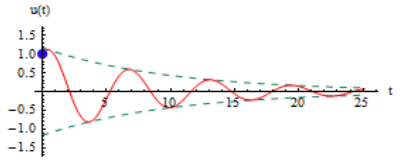
$\xi = 0.172237$

ASCE 三種阻尼, 2018

Viscous damping

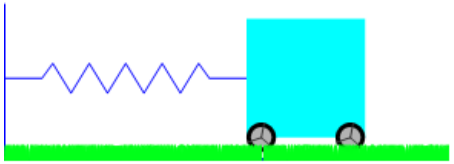
exponential decay

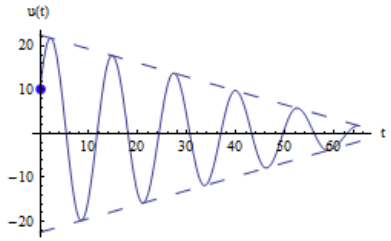




Coulumb damping

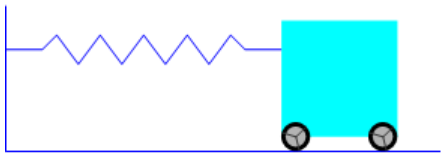
linear decay

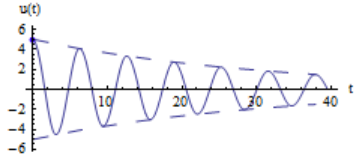




Hysteretic damping

等比 decay

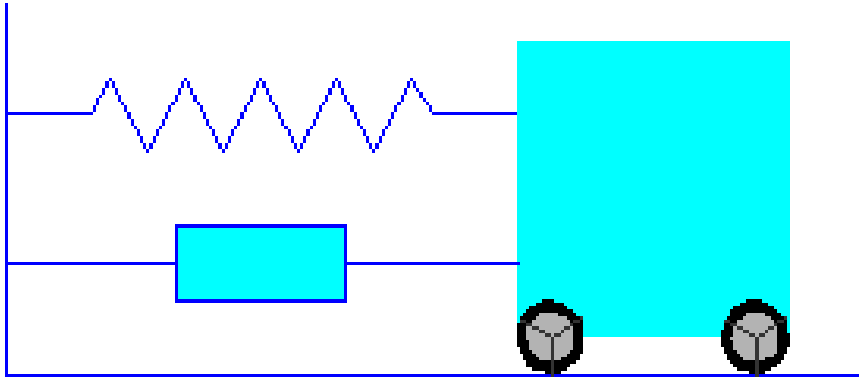


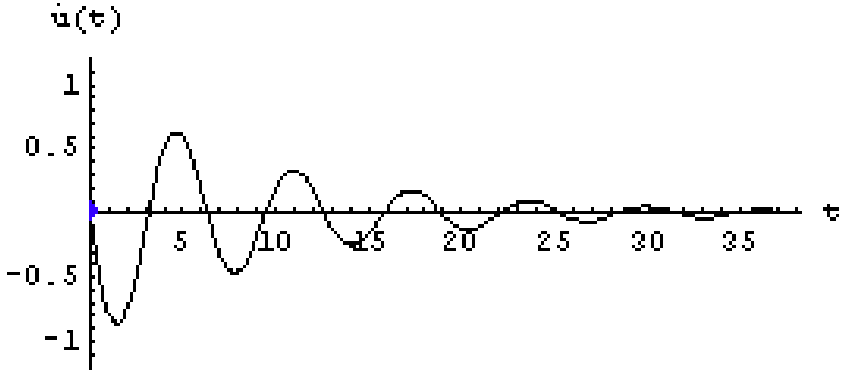


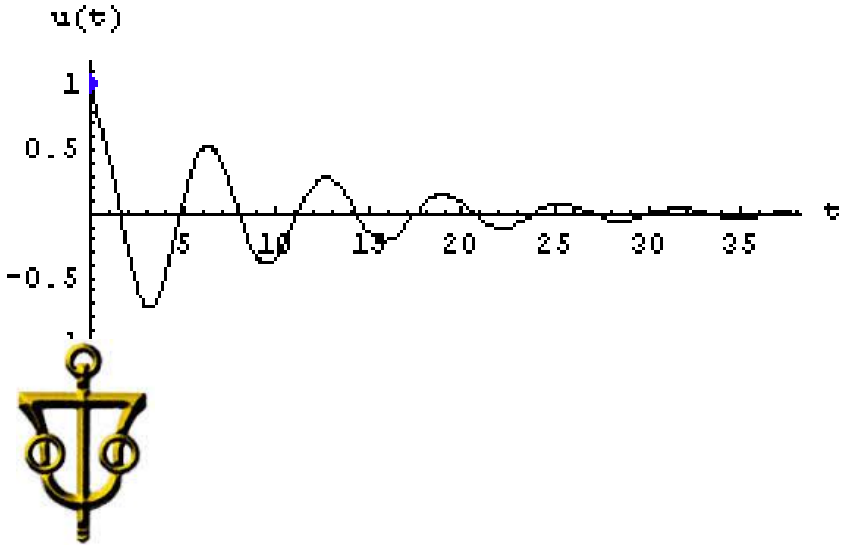
Damping models (李家瑋)

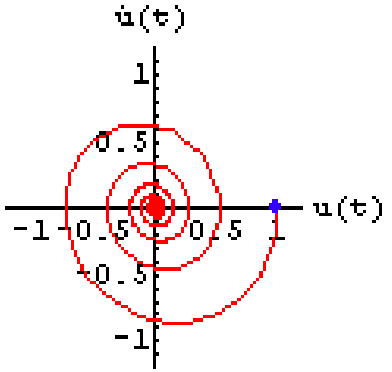
Viscous damping

exponential decay





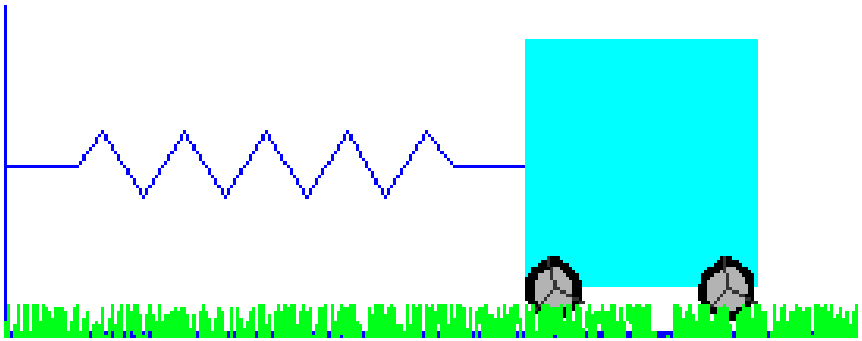


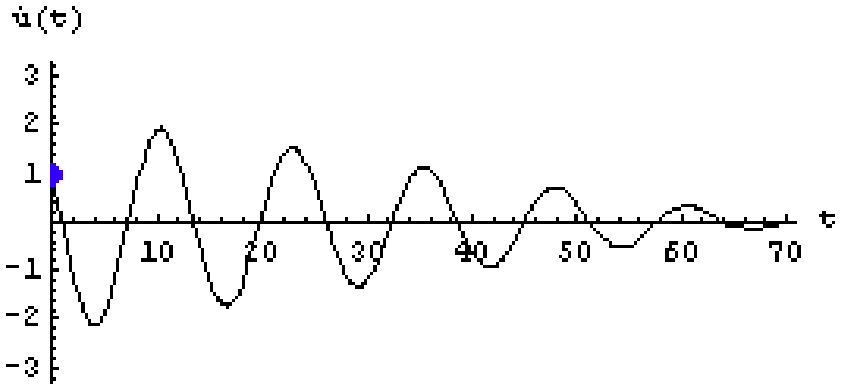


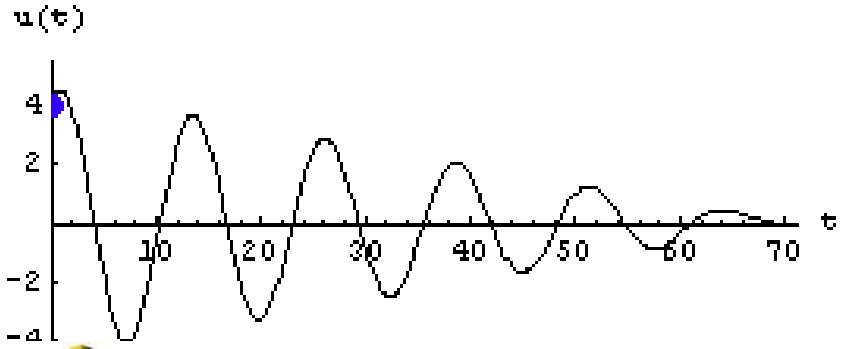
Damping models (李家瑋)

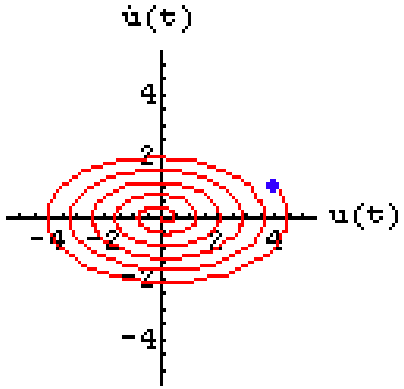
Coulomb damping

linear decay





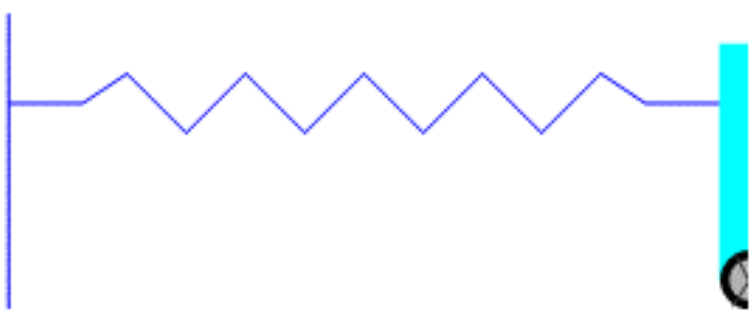


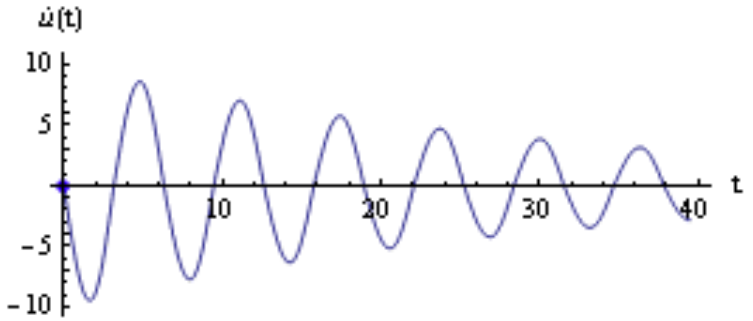


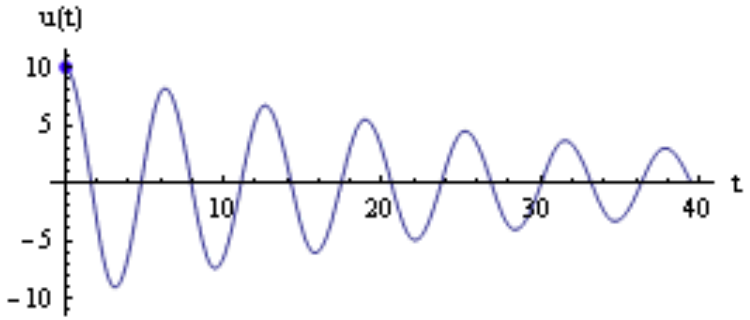
Damping models (李家瑋)

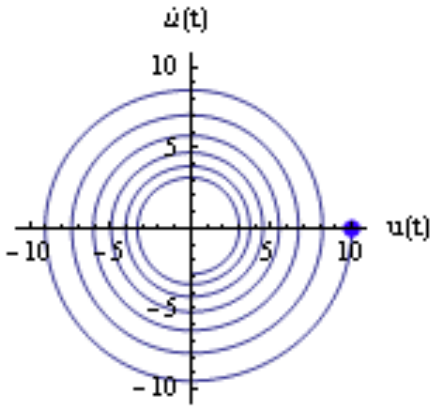
Hysteretic damping

等比 decay





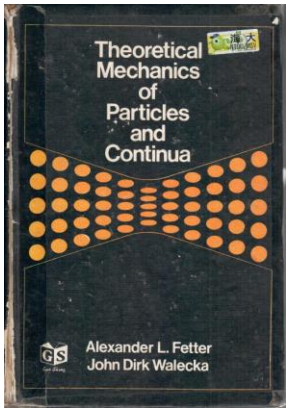




Part II-2: Natural modes Animation of dynamic response

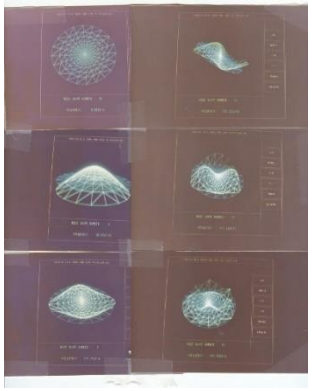
Free Vibration (重根)
一路走來三十六年(1984-2022)

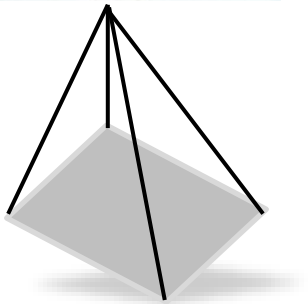
1984
理論專書
Fetter & Walecka



P.131
(鮑亦興教授)

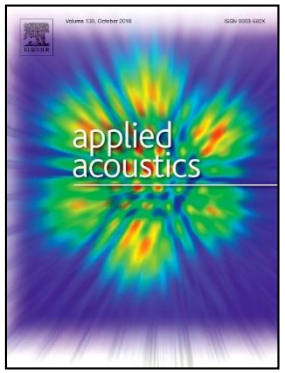
1985
FEM 數值試驗
(張善政教授)

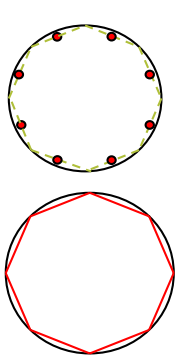




應力所模態試驗

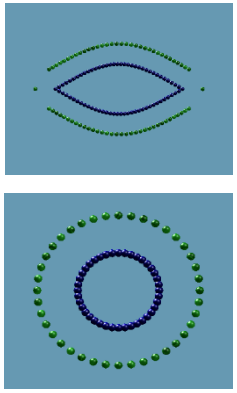
1999
BEM 數值試驗
Applied Acoustics



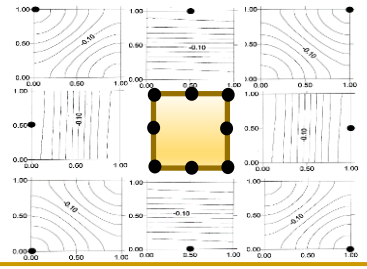


Vol. 57(4) P. 293-325

2005
MFS 數值試驗
EABE
(陳正宗教授)



Vol. 29(2) P.166-174



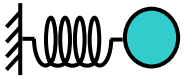
2009
實作試驗
士林科工館

Real experiment

時間:兒童節 2009
地點:士林 科博館
示範人員:吳宗政

Free vibration of MDOF

高聖凱



余東軒

1-DOF

張毓玲

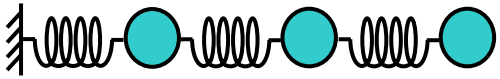
施佑勳

陳思瑋

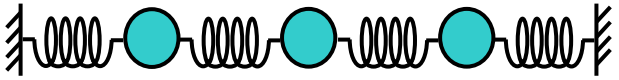
2-DOFs

楊雅鈞

詹雅馨



李家瑋

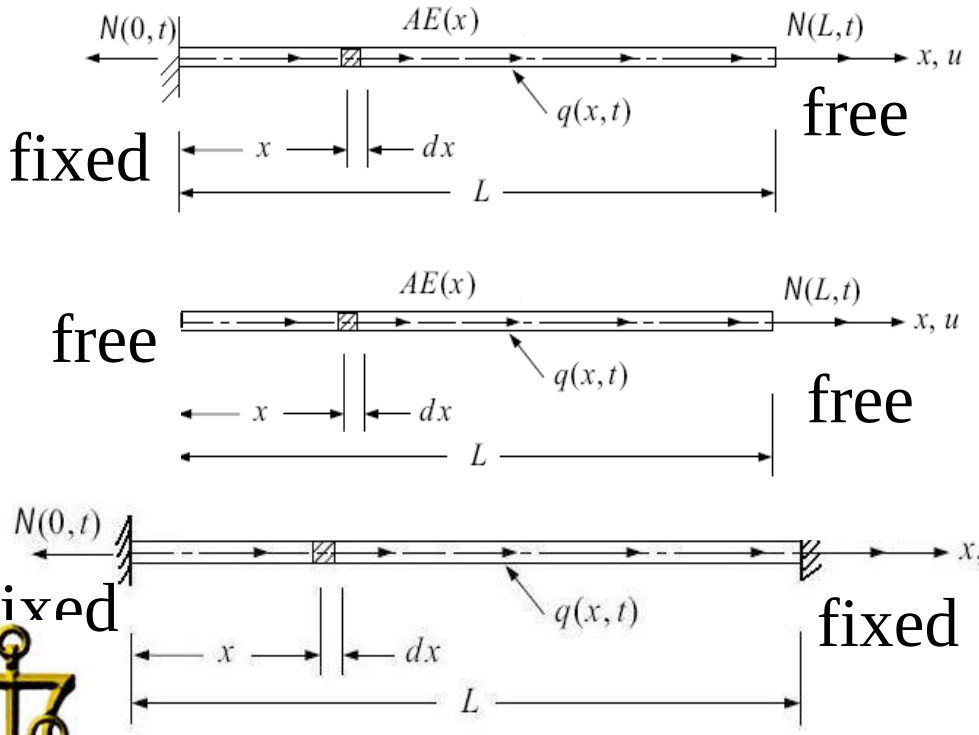


3-DOFs

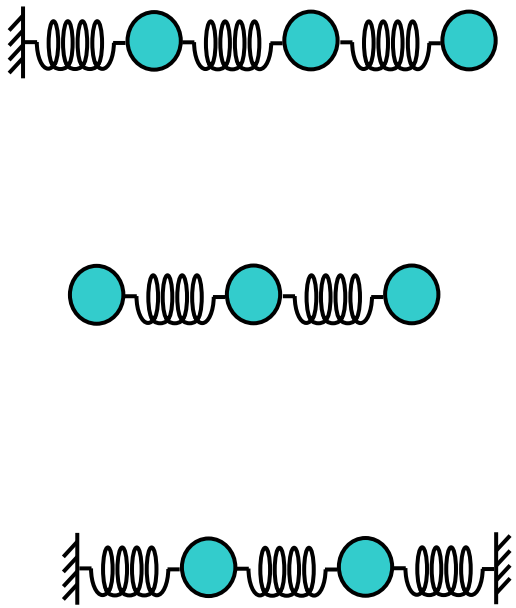
Free vibration of continuous system

(張毓玲-中工學生論文競賽佳作, 2008)

Continuous system

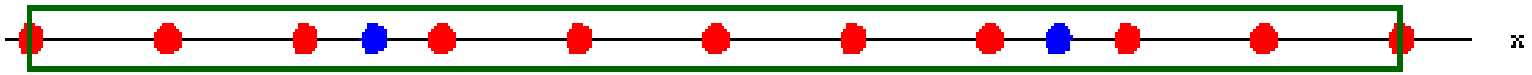


Discrete MDOFs



Free vibration of continuous system and MDOF (free-free)

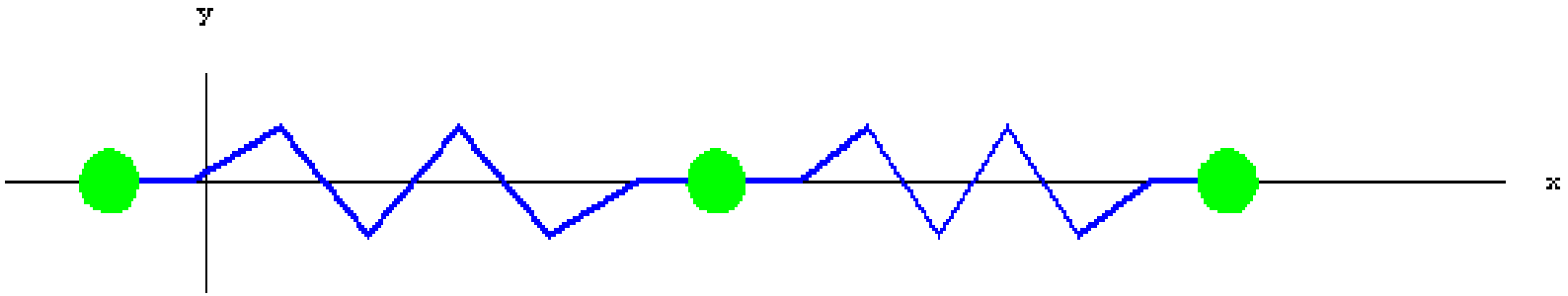
(張毓玲-中工學生論文競賽佳作, 2008)



Continuous system

free

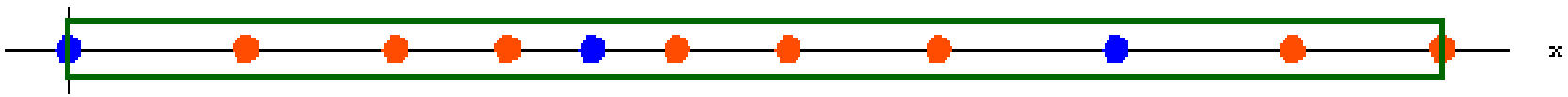
free



Discrete system

Free vibration of continuous system and MDOF (fixed-free)

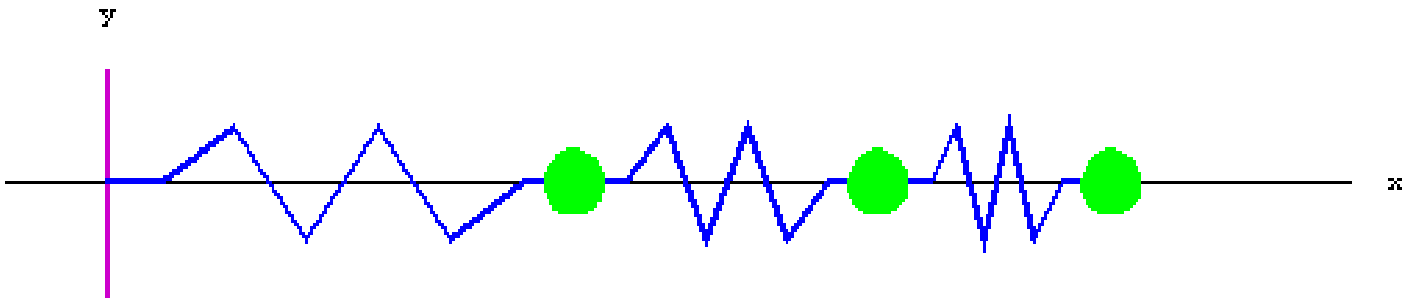
(張毓玲-中工學生論文競賽佳作, 2008)



fixed

Continuous system

free



Discrete system

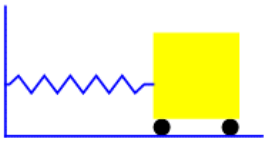
振動三部曲(2018)

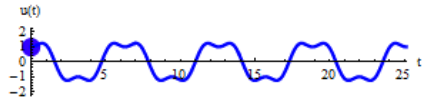
2014力學營學員陳聖劻學長分享

$$\ddot{x} + \omega^2 x = 3\cos(\Omega t), \omega = \sqrt{\frac{m}{k}}$$

Excitation ($\omega \neq \Omega$)

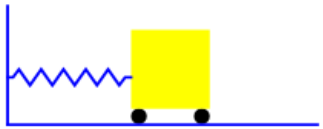
$$\omega = 1, \Omega{=}3, x(t) = \frac{11}{8}\cos(t) - \frac{3}{8}\cos(3t)$$

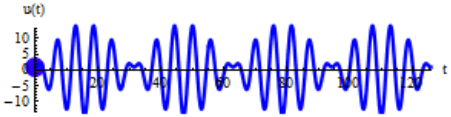




Beating ($\omega \approx \Omega$)

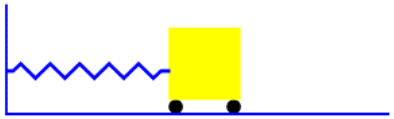
$$\omega = 1, \Omega{=}1.2, x(t) \approx 7.82\cos(t) - 6.82\cos(1.2t)$$

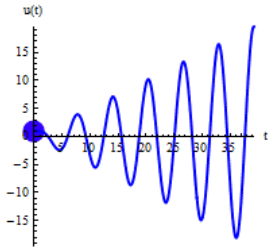




Resonance ($\omega = \Omega$)

$$\omega = \Omega{=}1, x(t){=}\cos(t) + \frac{1}{2}t\sin(t)$$





Mechanics Sound Laboratory Vibration

結婚前（單自由度）&結婚後（雙自由度）

單 身

結 婚

床頭吵

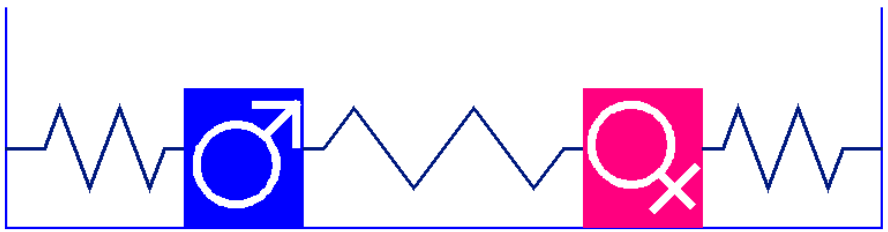
床尾和

同 步

結婚前&結婚後　互動模式

結婚前

結婚後

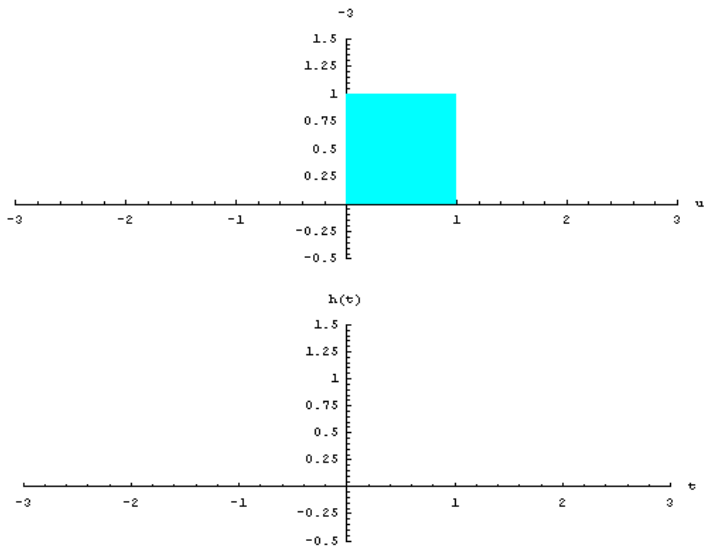


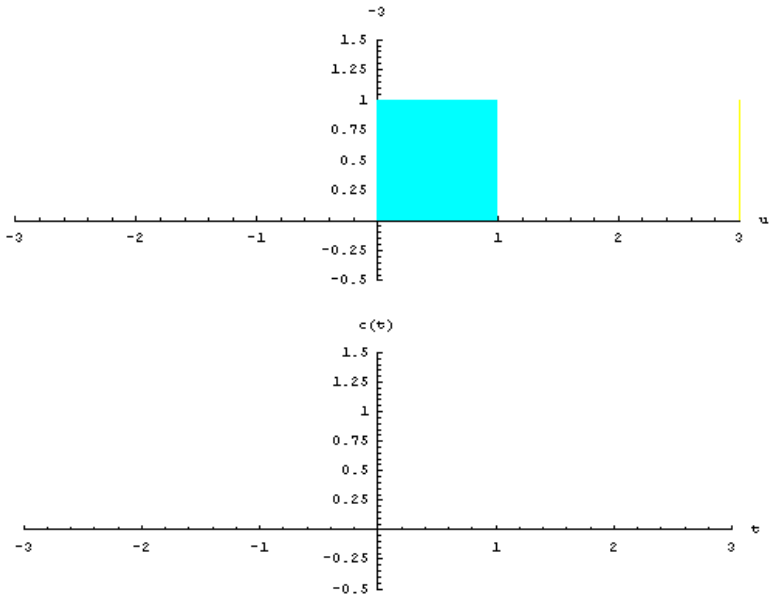
結婚前

結婚後

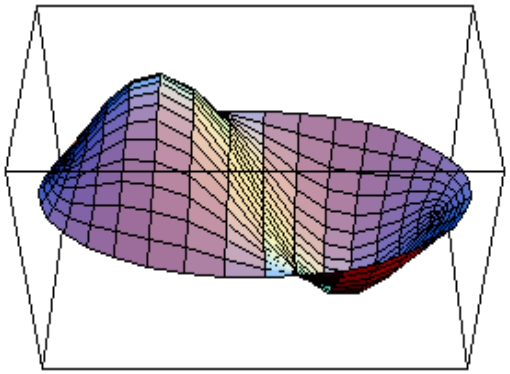
Convolution vs Correlation

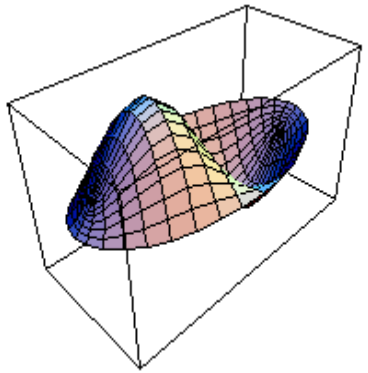
$$f(t) \otimes g(t) = \int_{-\infty}^{\infty} f(u)g(t-u)du \qquad f(t) \odot g(t) = \int_{-\infty}^{\infty} f(u)g(t+u)du$$



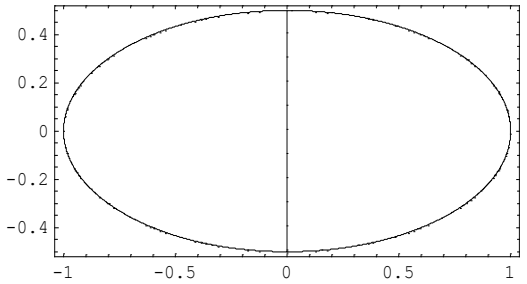


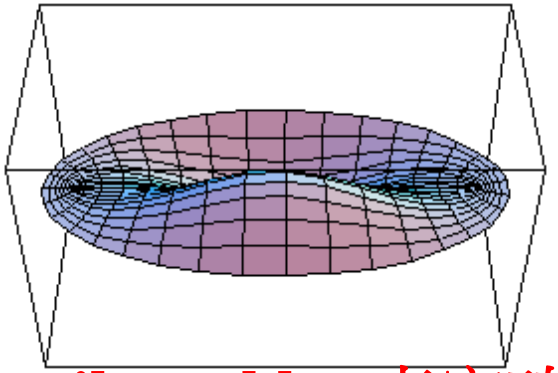
Animation using Mathematica software

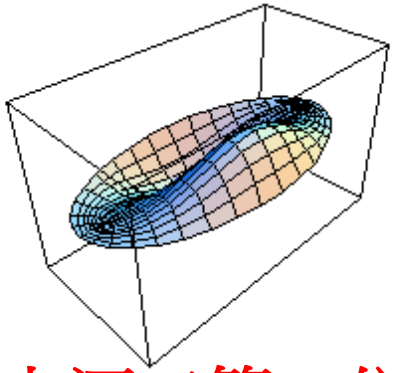




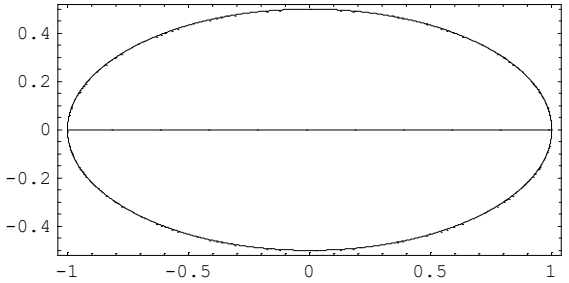
k=5.010





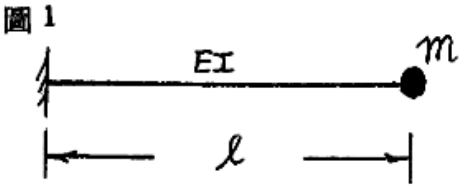


k= 6.852



Contributed by 李家瑋(海大河工第一位五年一貫, June, 2009)

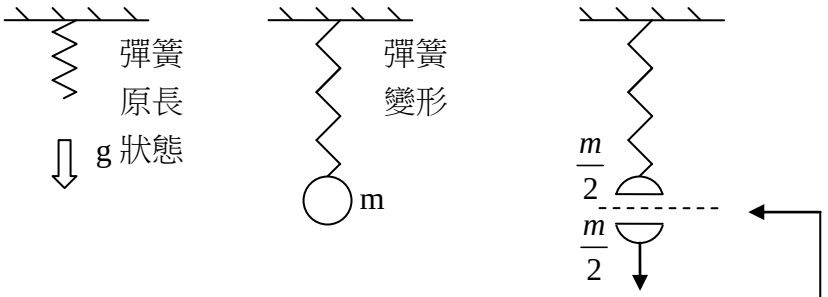
教學結合國家考試



八十二年專門職業及技術人員高等考試試題　高：11－2　全一頁

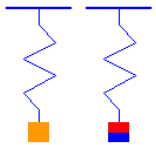
類　　科：結構工程技師
科　　目：結構動力分析
考試時間：二小時

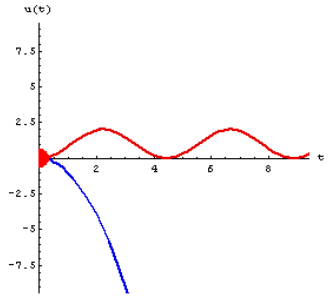
一、一懸臂梁如圖 1 所示，右端有一集中質量 m，假設梁之質量不計，（25 分）
(一)試求自然週期。
(二)當集中質量 m 停留在梁上有一段時間後，有一半質量掉落，試求右端之位移狀況（假設阻尼比為 0.01）。

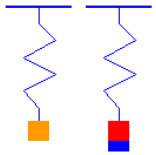


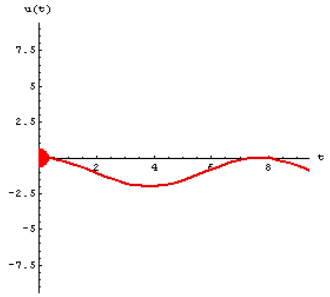
(a) 原長　(b) 靜力平衡後狀態　(c) 突然質量掉半塊

(Hint:座標原點隨您設)　接下來上半部 $\frac{m}{2}$ 質點會怎麼動？









數學建模

三種不同的觀察座標系統-客觀性

Problem: a SDOF mass-spring system with a mass m and a spring constant k in equilibrium.
原長 A half mass drops out suddenly, Please describe the vibration phenomenon. 靜力平衡

Reference 1: $x_1(t)$ positive downward from original length of spring

governing equation $\frac{m}{2}\ddot{x}_1(t)+kx_1(t)=\frac{mg}{2}$

initial conditions $x_1(0)=mg/k, \dot{x}_1(0)=0$

solution $x_1(t)=\frac{mg}{2k}cos(\omega_1 t)+\frac{mg}{2k}>0, for\ any\ t$

where $\omega_1^2=2k/m$.

Reference 2: $x_2(t)$ positive downward from equilibrium point

governing equation $\frac{m}{2}\ddot{x}_2(t)+k(x_2(t)+mg/k)=\frac{mg}{2}$

initial conditions $x_2(0)=mg/k, \dot{x}_2(0)=0$

solution $x_2(t)=\frac{mg}{2k}cos(\omega_1 t)-\frac{mg}{2k}$

$$x_1(t)=x_2(t)+\frac{mg}{k}=x_3(t)+\frac{2mg}{k}$$

All the three solutions are the same in the physical sense.

All the three solutions obeys the objectivity, i.e. frame indifference

Reference 3: $x_3(t)$ positive downward from the lowerest point 最低點

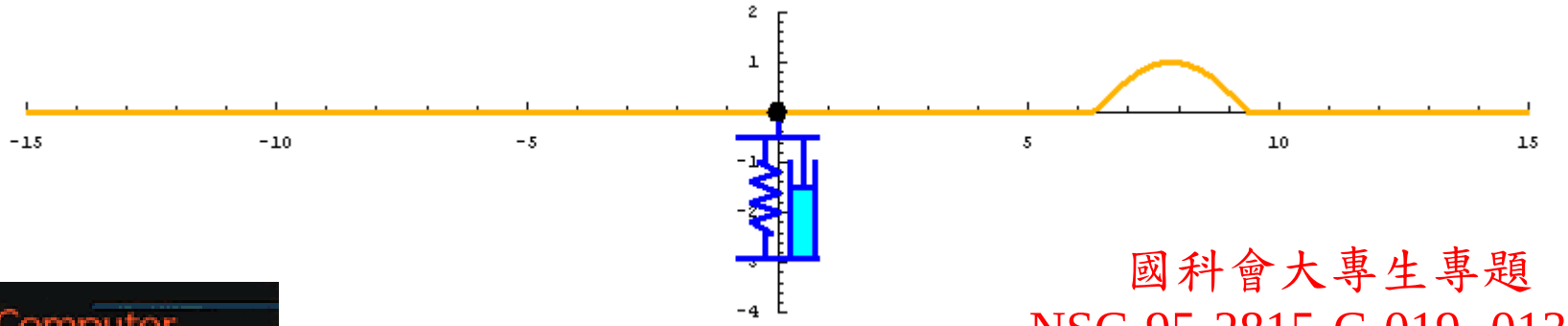
governing equation $\frac{m}{2}\ddot{x}_3(t)+k(x_2(t)+2mg/k)=\frac{mg}{2}$

initial conditions $x_3(0)=-mg/k, \dot{x}_3(0)=0$

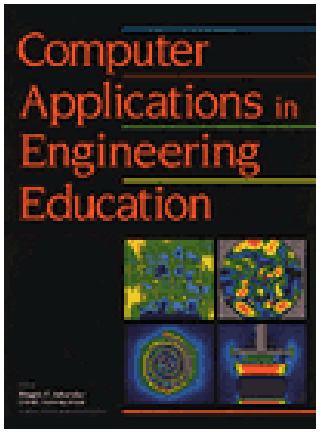
solution $x_3(t)=\frac{mg}{2k}cos(\omega_1 t)-\frac{3mg}{2k}$

CAEE 一維波動

CAEE, Vol.17, No.3, pp.323-339 , 2009



國科會大專生專題
NSC-95-2815-C-019 -013 -E



Waves in string using Diamond rule and Mathematica software

Read 582

Diamond rule

林紹雄→陳正宗→高聖凱

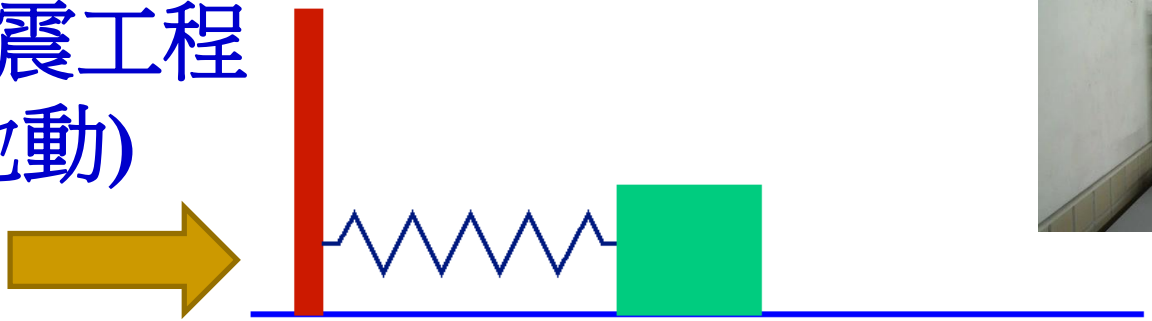
Part II-3: Support motion Animation of dynamic response

地震工程與風工程(風吹地動)

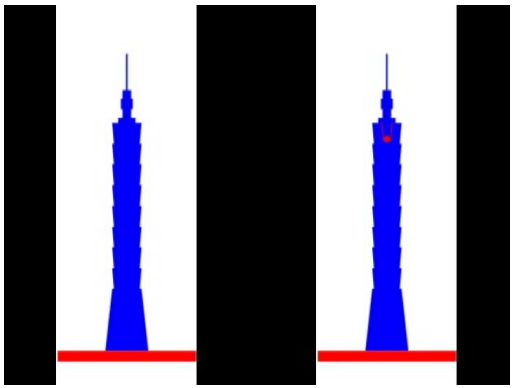
$$m\ddot{x} + kx = -m\ddot{x}_g$$

Earthquake Engineering:

地震工程
(地動)

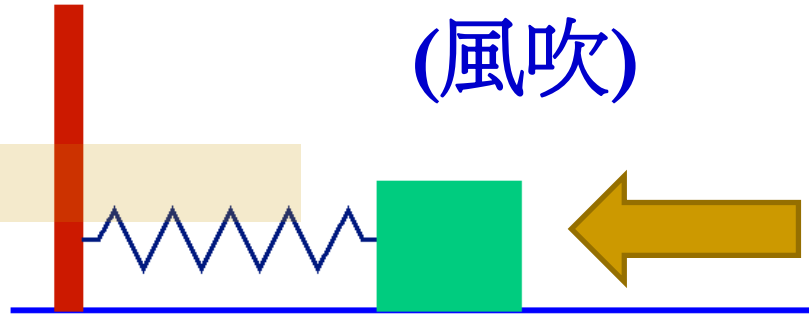


風工程
(風吹)



Wind Engineering:

$$m\ddot{x} + kx = p(t)$$

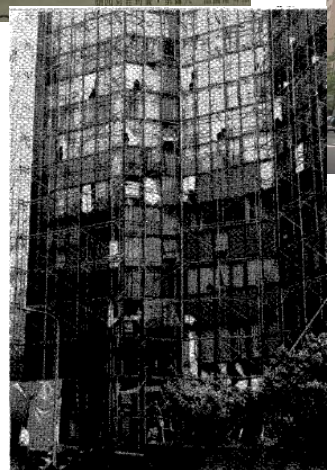


台灣版

裕台大樓12F-16F(台北市復興南路一段)

1986年11月15日 05:20

花蓮地震

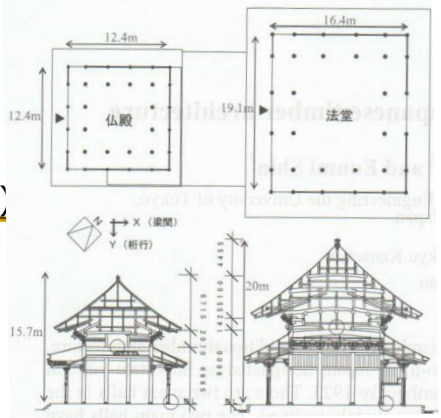


日本版 (藤田香織教授提供)

建長寺(Kencho-Ji)

1923年

關東大地震



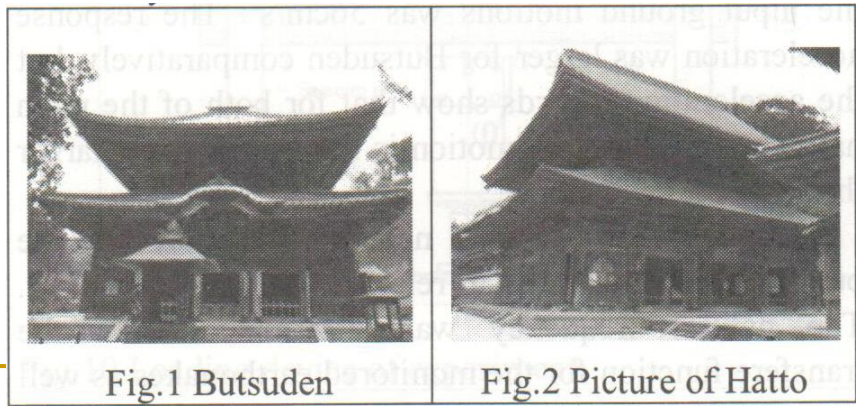


Fig.1 Butsuden

Fig.2 Picture of Hatto

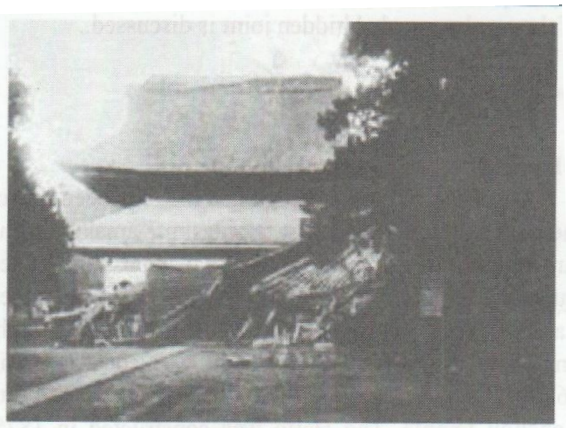


Fig.4 *Kanto* Earthquake (1923) collapsed *Butsuden* and inclined Hatto

猜猜哪一種崩塌?
大的Hatto?小的?

Mass inertia effect?
Joint effect?
Aging effect?
Resonance effect?

相關應用

- 數值振動台

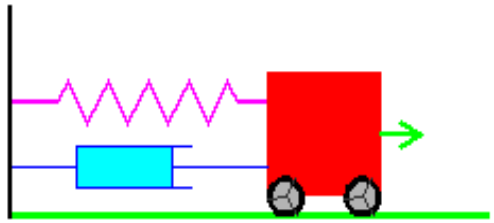
- 仿生力學

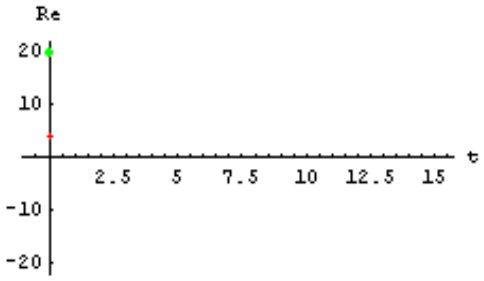
Part II-4: Forced vibration Animation of dynamic response

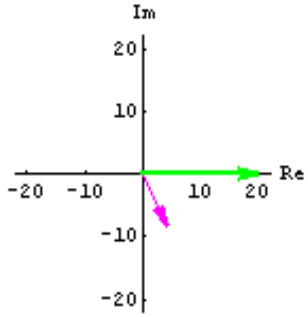
Complex input versus complex output (高聖凱與李家瑋)

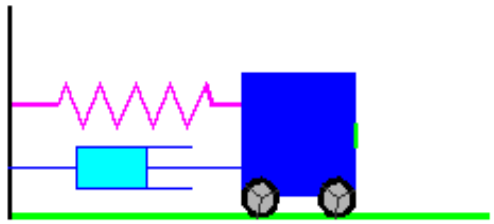
m, c, k system ($c \neq 0$, $\Omega \neq \omega$)

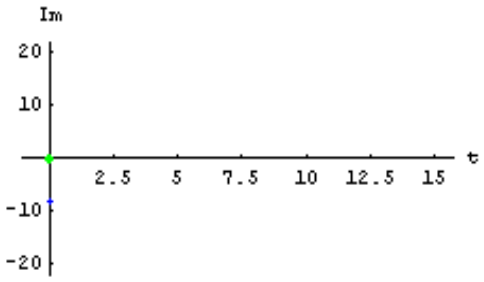
Forcing term: $\cos(\Omega t)$ Response

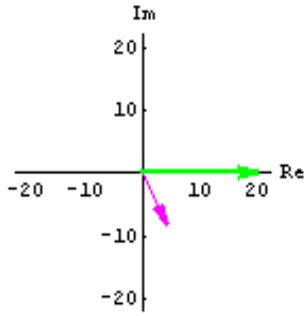












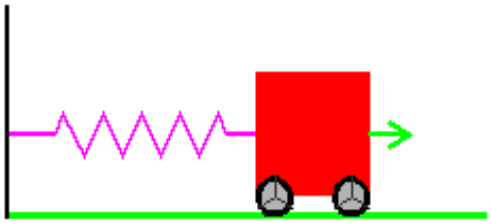
Forcing term: $\sin(\Omega t)$ Response

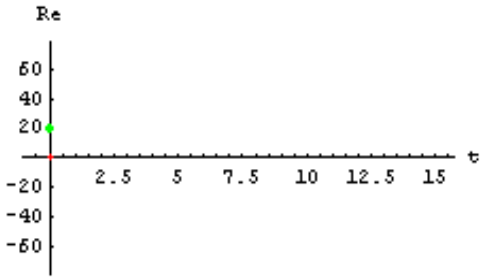
Complex input versus complex output (高聖凱與李家瑋)

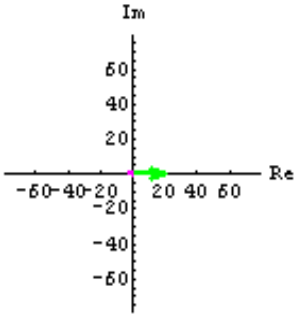
Resonance

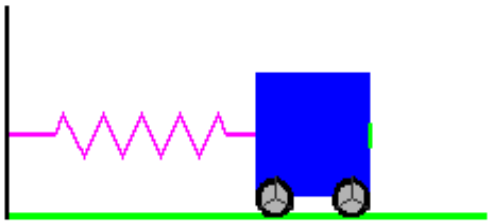
m, c, k system (c=0, Ω=ω) $\omega = \sqrt{\frac{k}{m}}$

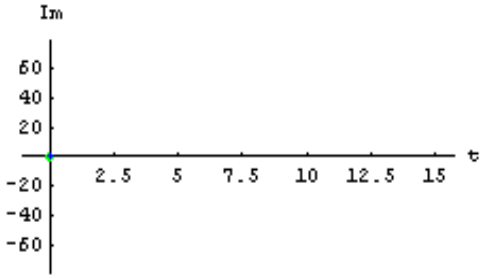
Forcing term: cos(Ω t) Response

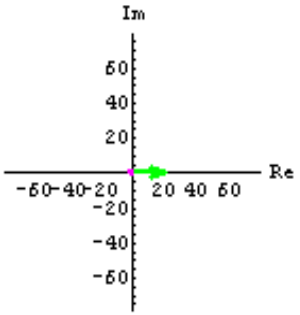








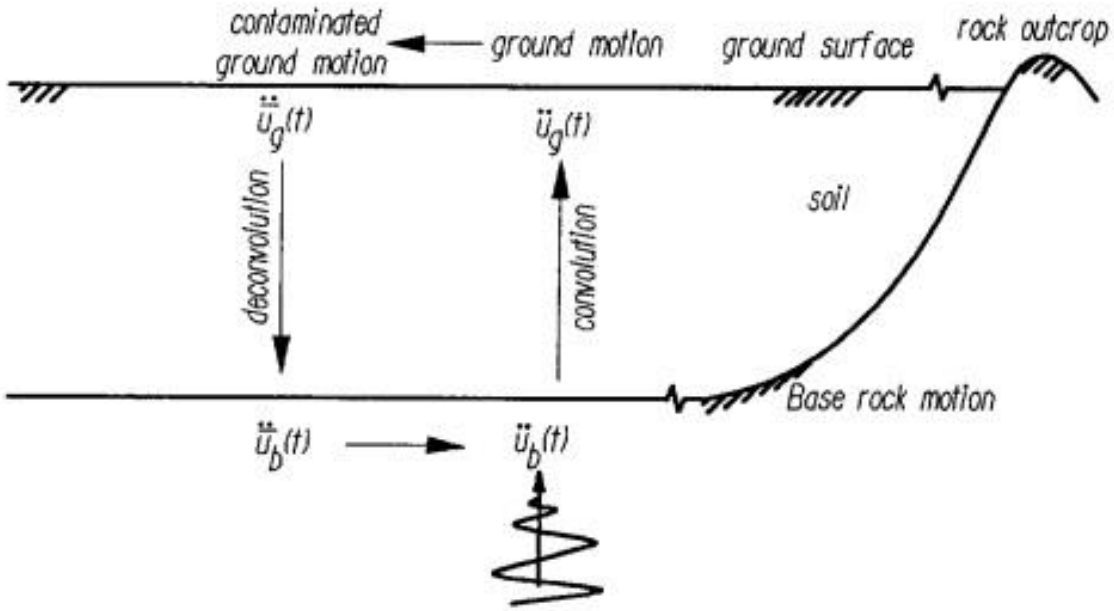




Forcing term: sin(Ω t) Response

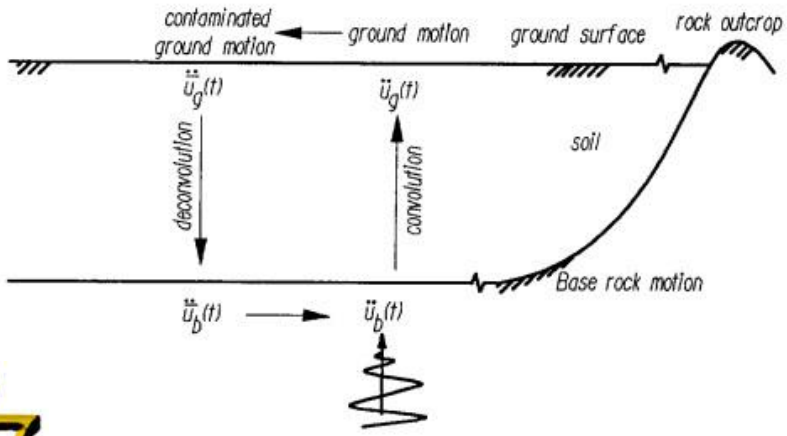
Part III:
Direct and inverse problems

Convolution and deconvolution



What happen in the inverse problem ?

Well-posed model ? Ill-posed problem



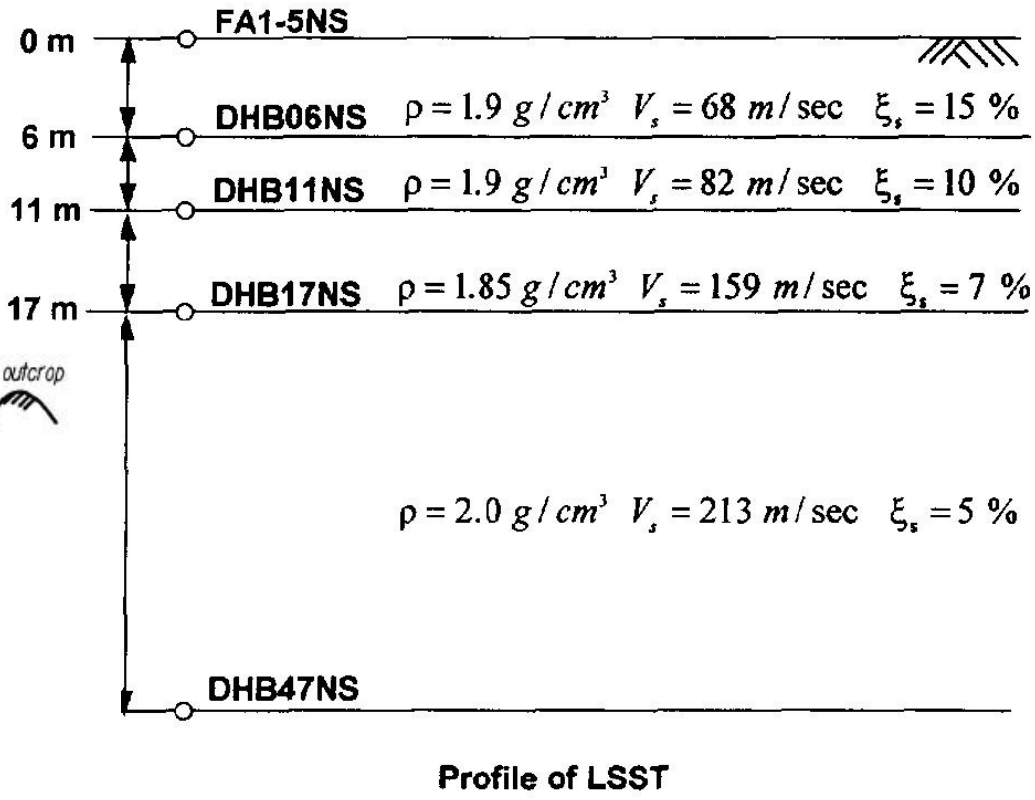


Fig. 12. Soil profile of the far-field at the LSST site.

Divergent result (no treatment)

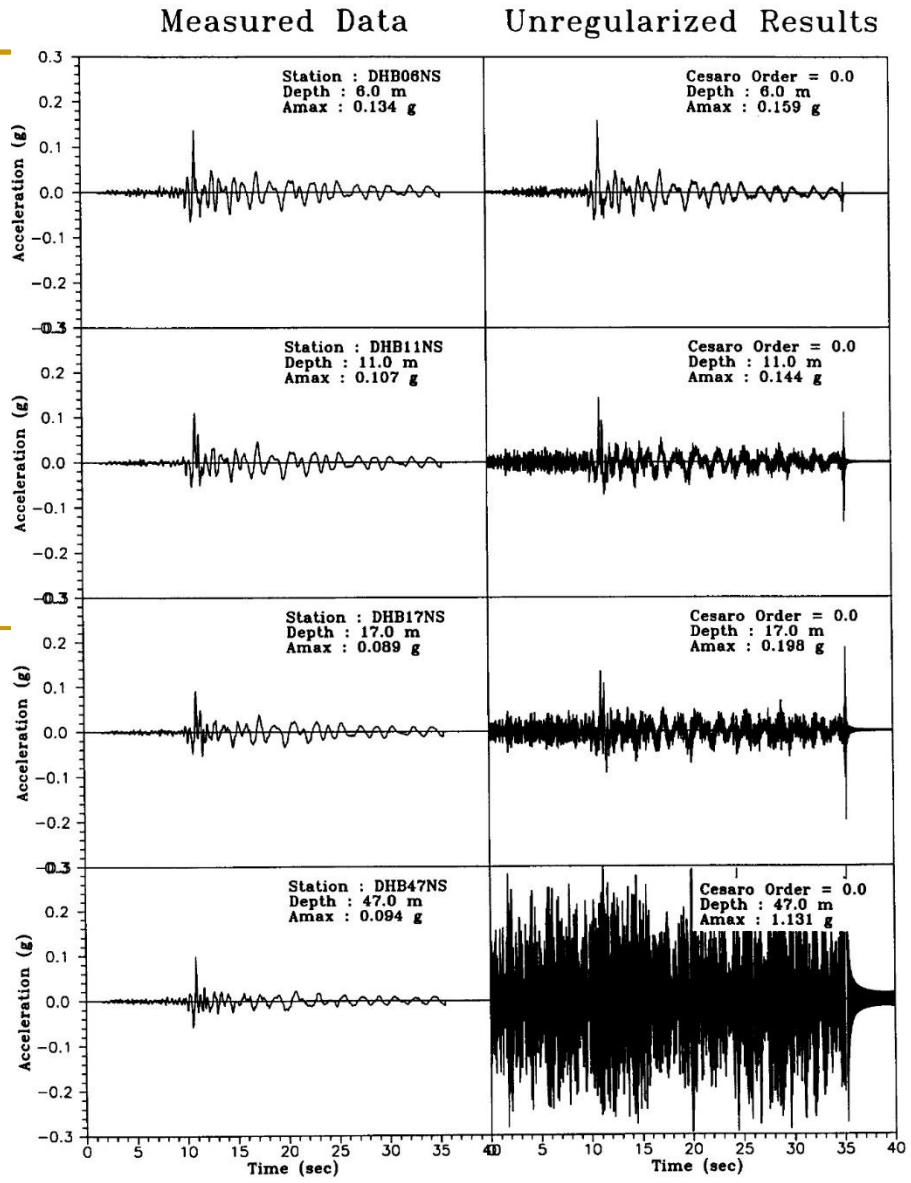


Fig. 14. Comparison of measured data and unregularized results. (a) Time history. (b) Fourier coefficient spectrum.

Filter (Cesaro window)

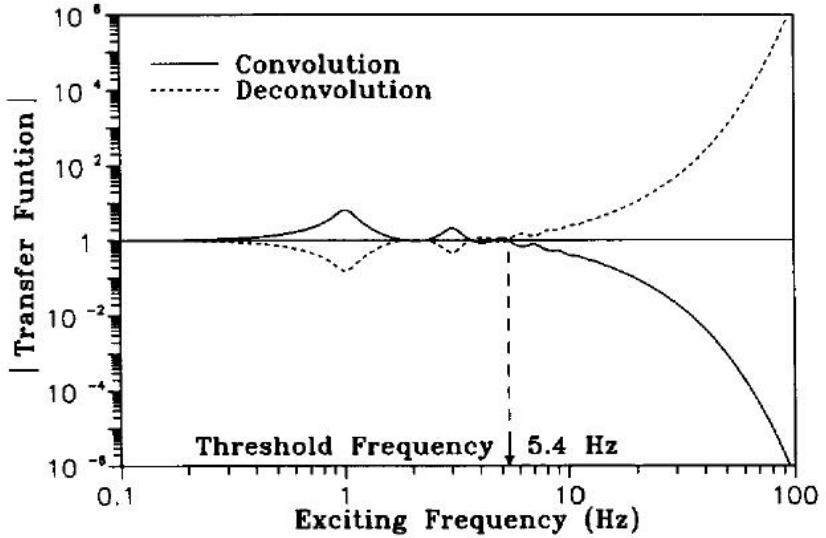


Fig. 2. Transfer functions of convolution and deconvolution.

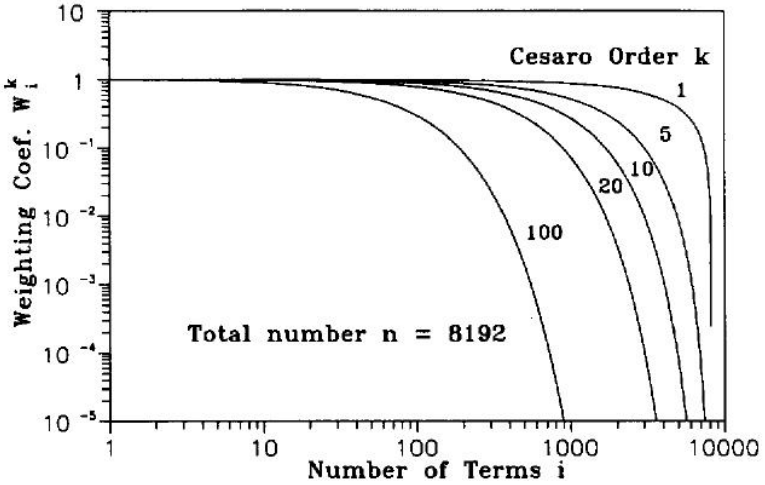
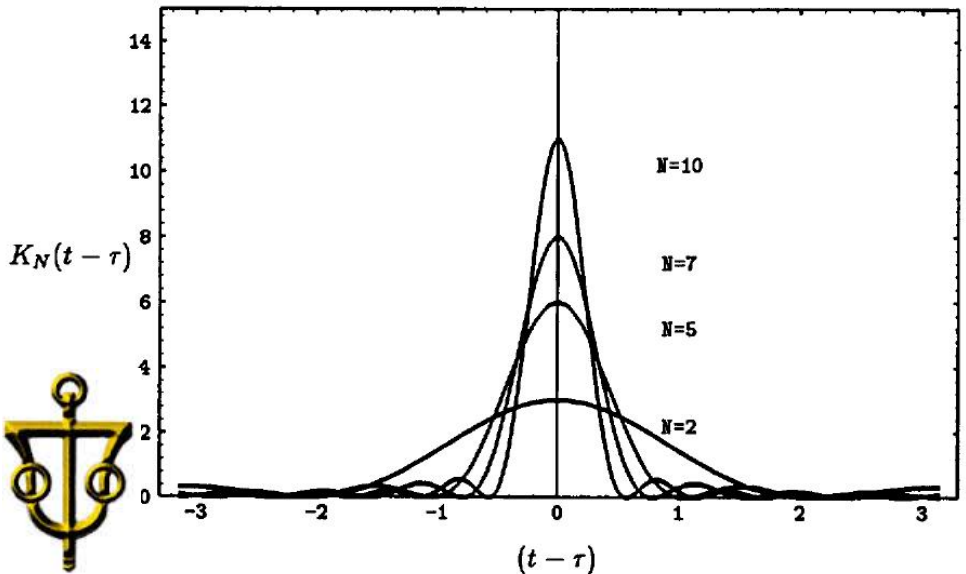


Fig. 3. Cesàro window function.



Corner for optimization in the L curve

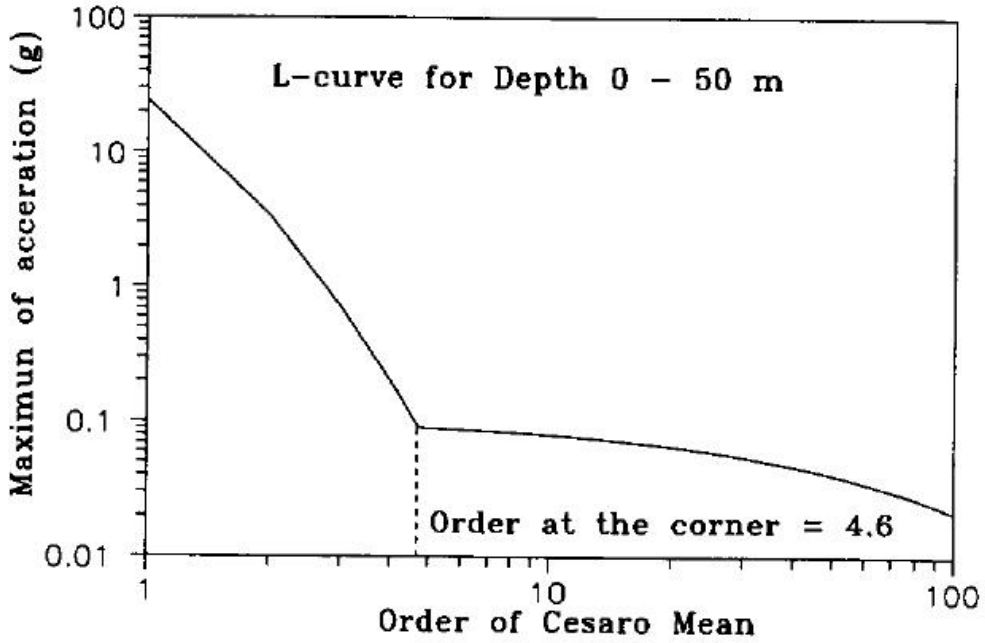


Fig. 9. The constructed L-curve of a single layer example.

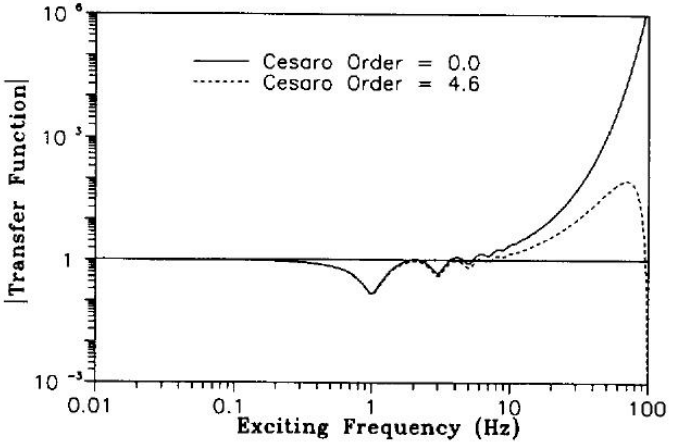


Fig. 10. Suppressed transfer function of Cesàro order 4.6.

Divergent result (regularization)

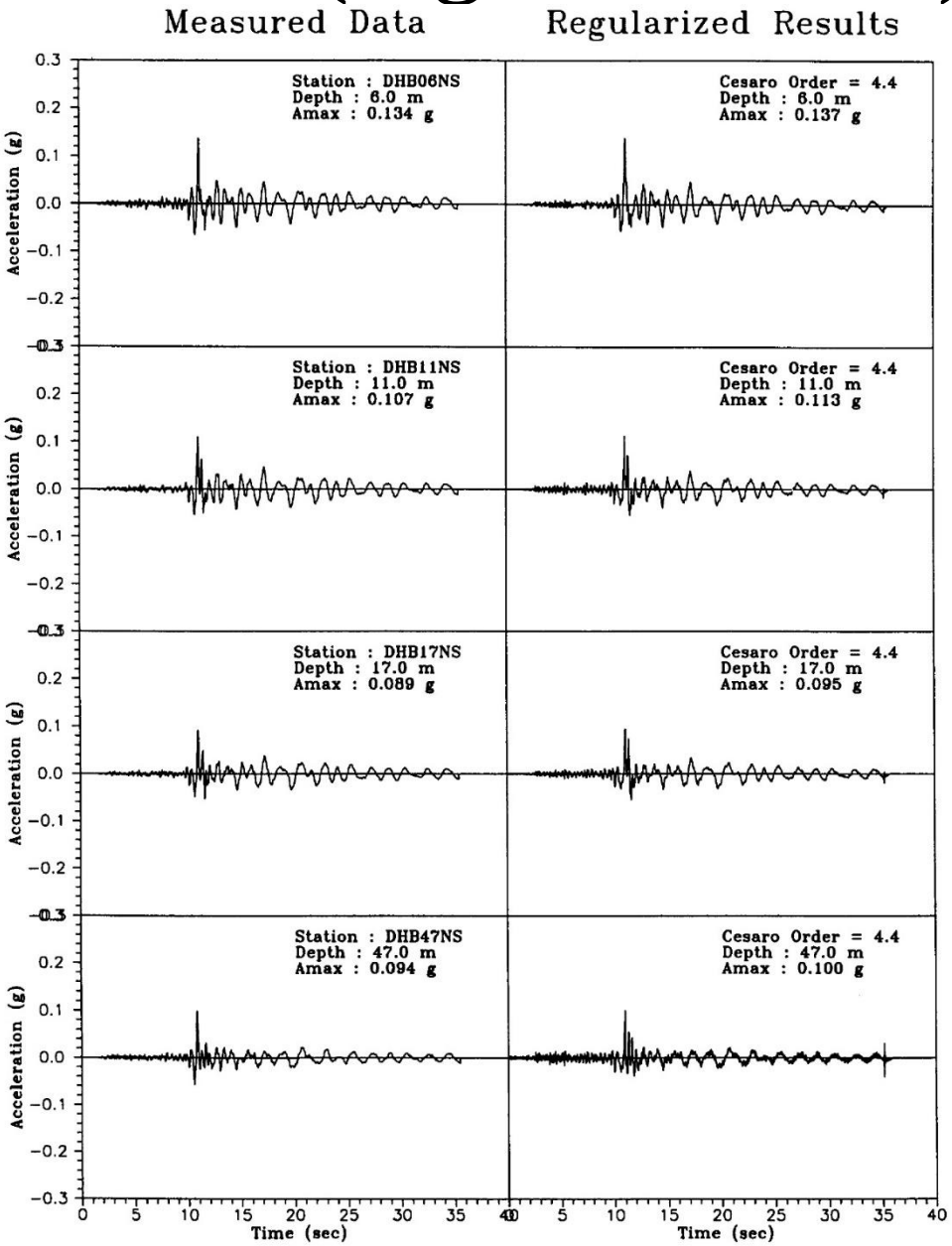


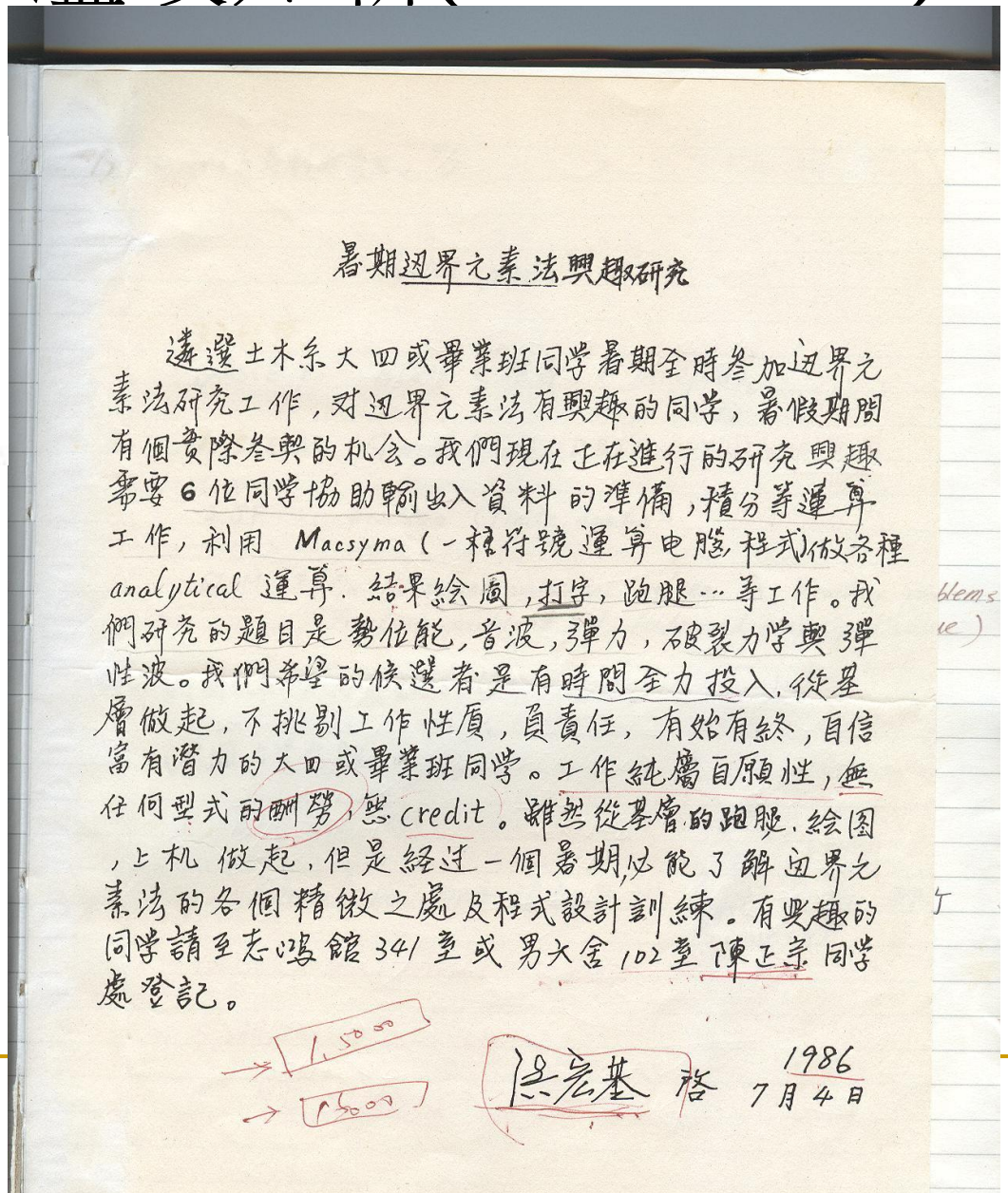
Fig. 16. Comparison of measured data and regularized results. (a) Time history. (b) Fourier coefficient spectrum.

淡江海大大家一起努力

溫故知新(1986-2022)

洪宏基陳正宗

王淑娟葛德治
陳瑞宏 吳文華
邱佑宗 陳國慶
曹永德 吳重成
彭伯峰 朱坤煌
呂學育



暑期迴界元素法興趣研究

遴選土木系大四或畢業班同學暑期全時參加迴界元素法研究工作，对迴界元素法有興趣的同學，暑假期間有個實際參與的机会。我們現在正在進行的研究興趣需要6位同學協助輸出入資料的準備，積分等運算工作，利用 Macsyma（一種符號運算电腦程式）做各種 analytical 運算. 結果繪圖，打字，跑腿…等工作。我們研究的題目是勢位能，音波，彈力，破裂力學與彈性波。我們希望的候選者是有時間全力投入，從基層做起，不挑剔工作性質，負責任，有始有終，自信富有潛力的大四或畢業班同學。工作純屬自願性，無任何型式的酬勞，無 credit。雖然從基層的跑腿，繪圖，上机做起，但是經过一個暑期必能了解迴界元素法的各個精微之處及程式設計訓練。有興趣的同學請至志鳴館341室或男大舍102室陳正宗同學處登記。

1,500
1,500

洪宏基 格 1986 7月4日

大學生SCI論文成功案例(NTOU/MSV 1984-2022) 小兵立大功

鄭岳世	Dual series representation and its applications to a string subjected to support motions (1996)	ADV
陳桂鴻*	Analytical study and numerical experiments for Laplace equation with overspecified BCs (1998)	AMM
劉立偉**	On the free terms of the dual BEM for the two and three- dimensional Laplace problems (2000)	JMST
林盛益	A new point of view for the polar decomposition using singular value decomposition (2002)	IJCN
李應德***、葉雅婷	A meshless method for free vibration analysis of circular and rectangular clamped plates using radial basis function (2004)	EABE
蔡明宏	Conformal mapping and bipolar coordinate for eccentric problems (2008)	CAEE
高聖凱	Waves in string using diamond rule and Mathematica software (2008)	CAEE
謝正昌	Derivation of stiffness and flexibility for rods and beams by using dual integral equations (2008)	EABE
吳國綸	Regularized meshless mathod for Cauchy problems (2008)	CM
李家瑋 ****	On the spurious eigensolutions for the real-part boundary element method (2008)	EABE
余尚儒	Equivalence between Trefftz method and method of fundamental solution for the annular Green's function (2008)	EABE
蕭宇志	Analysis of water wave problems containing single and multiple cylinders by using the degenerate kernel method (2010)	ISOPE
高怡絹	Eigenanalysis for a confocal prolate spheroidal resonator using the null-field BIEM in conjunction with degenerate kernels (2014)	Acta Mechanica
涂雅瀞	A self-regularized approach for deriving the free-free flexibility and stiffness matrices (2014)	CS
黃乙玲	Revisit of the degenerate scale for an infinite plane problem containing two circular holes using conformal mapping (2019)	AML
邵程祥、呂政軒	On the linkage between influence matrices in the BIEM and BEM to explain the mechanism of degenerate scale (2021)	JOM
周彥廷	On the path independence and invariant of the J-integral for a slant crack and rigid-line inclusion using degenerate kernels and the dual BEM (2021)	EABE
戴暐宸	An indirect BIE free of degenerate scales (2021)	CPAA
邵程祥、戴暐宸	On the role of singular and hypersingular BIEs for the BVPs containing a degenerate boundary (2021)	EABE
高浩真	Support motion of a finite bar with an external spring (2022)	JLFNVAC

*：陳桂鴻現任於國立宜蘭大學土木工程學系副教授
**：劉立偉現任於國立台灣大學土木系(國立成功大學工程科學系助理教授)
***：李應德現任於國立台灣海洋大學河海工程學系助理教授
****：李家瑋現任於淡江大學土木工程學系助理教授

一個教授的養成教育都是從大學部就一點一滴的栽培方能奏功

以前大學部學長姊(帥哥美女)做的到，你們一定也做的到

NTOU/MSV 大學部 SCI 論文發表榮譽榜

鄭岳世

(ADV, 1996)

陳桂鴻

(AMM, 1998)

劉立偉

(JMST, 2000)

林盛益

(IJCN, 2002)

葉雅婷

(EABE, 2004)

蔡明宏

(CAEE, 2008)

謝正昌

(EABE, 2008)

吳國綸

(CM, 2008)

余尚儒

(EABE, 2008)

高聖凱

(CAEE, 2008)

李家瑋

(EABE, 2008)

蕭宇志

(ISOPE, 2010)

高怡絹

(Acta Mechanica, 2014)

涂雅瀞

(CS, 2014)

黃乙玲

(AML, 2019)

高浩真

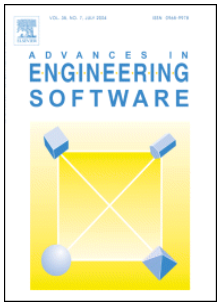
(JLFNVAC, 2022)

邵程祥&呂政軒 (JOM, 2021)　戴暐宸 (CPAA, 2021)　周彥廷 (EABE2021)

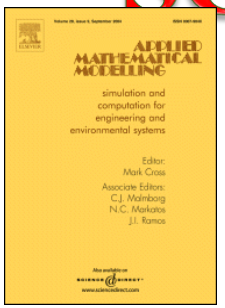
大學生SCI論文成功案例
(MSV 1984-2022)小兵立大功

有為者，亦若是

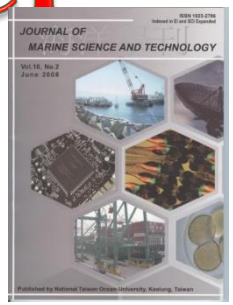
SCI



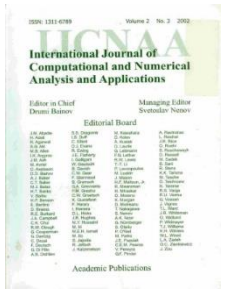
1996 鄭岳世



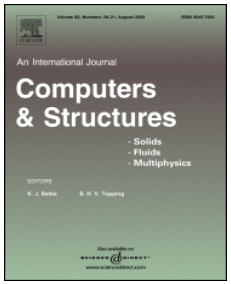
1998 陳桂鴻



2000 劉立偉



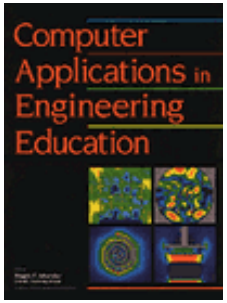
2002 林盛益



2014 涂雅瀞

2018 陳聖勛

2021 周彥廷
2021 邵程祥 呂政軒

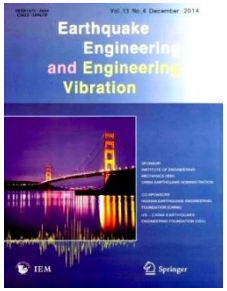


2008 蔡明宏
2008 高聖凱

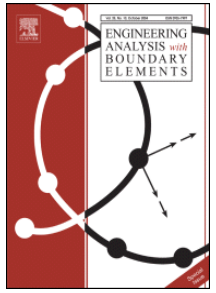
2008 吳國倫

2010 蕭宇志

2014 高怡絹

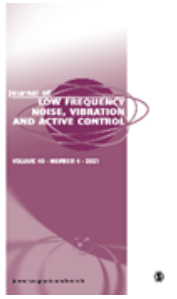


2016 涂雅瀞



2004 葉雅婷
2008 謝正昌
2008 李家瑋
2008 余尚儒
2021 周彥廷 2021 邵程祥

2021 戴暐宸



2022 高浩真

-目前已有20篇文章刊登 培養出3位教授，遍及15種期刊-

Why we did this ?

- 提升同學學習興趣---眼見為憑
- 增進老師教學效能---有圖見真象 動畫即現象
- 讓同學早日接觸符號運算軟體
- 給教學與研究結合的一個機會
- 副產品 登上國際 SCI 期刊(NTOU/MSV大學生)

Take home message

- To be an engineer with mathematical background.
  To be a mathematician with physical concept
  and engineering judgement

- 數學家要多些搞工程計算的朋友與符號計算軟體
  工程師身邊則要多一些數學顧問與符號計算軟體

References

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感謝淡江大學李家瑋教授的邀請

感謝Phi Tau Phi 學會的經費支持

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