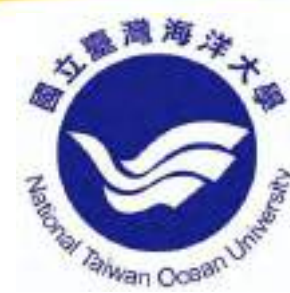


Phi Tau Phi 2026 Lecture



數學力學與計算-邊界元走過四十年(1986-2026)



- 主講人：陳正宗 特聘講座教授
科技部產學小聯盟 土機海領域召集人
海大河工系 機械系 海工系 台大土木系(客座) 成大土木系(合聘)三校五系教授
STAM & TwSIAM Fellow 數學與力學雙會士
- 報告時間：115年 10月22日 星期四下午1:10~3:00
- 報告地點：河工一館一樓遠揚講堂
- 課名: 河工綜論





Phi Tau Phi



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

南藝大校長邱上嘉博士



現任理事

海大校長許泰文博士



現任理事

台大校長陳文章博士



榮譽會員

陳正宗 特聘講座教授



與 Phi-Tau-Phi 在淡江大學結緣

1986



台大應力所



Phi Tau Phi



張建邦校長（理事長）
全員聚餐（淡江大學城中校區）



2026 Lecture

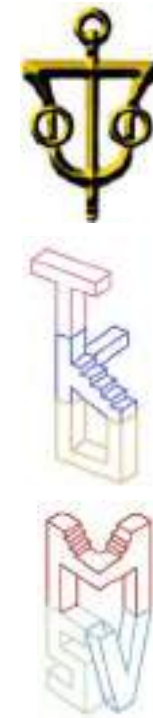
海大河工陳正宗特聘講座教授



時間	地點	邀請人	負責人
2026/01/16	中科院二所三組	邱垂鈺	全湘偉二所三組
2026/03/09	成大土木 地震風險	王雲哲	海成合聘課程(下)
2026/03/12	雲科大	溫志超	環安系
2026/03/13	台大數學系	王振男	臺日研討會
2026/06/16	琉球大學	宮崎達二郎 Tatsujiro Miyazaki,	台日交流
2026/10/3 (六)	海大河工系 碩專綜論	石瑞祥	碩專課程
2026/10/12(一)	成大土木 地震工程	王雲哲	海成合聘課程(上)
2026/10/22 (四)	海大河工系	石瑞祥	大學部 碩班 斐陶斐
2026/10/27 (二)	淡江土木系	李家璋	斐陶斐

土木工程學系 斐陶斐講座演講

數學力學與計算-邊界元走過四十年(1984-2026)



•主講人：陳正宗 特聘講座教授

科技部產學小聯盟 土機海領域召集人

海大河工系 機械系 海工系、台大土木系(客座)、成大土木系(合聘) 三校五系教授

STAM & TwSIAM Fellow 數學與力學雙會士

•報告時間：115年 10月27日（星期二）14:10 – 16:00

•報告地點：淡江大學土木系工學大樓E805





力學(NTOU/MSV)

力學(NTOU/MSV)



Is it possible ?



麗星郵輪 to Ishigaki(石垣島)

力學(NTOU/MSV)



(台灣啤酒)

Yes, it is possible

麗星郵輪 to Ishigaki(石垣島)

力學(NTOU/MSV)

It is possible (rod:Australlia)



(金門玉山高粱)



力學(NTOU/MSV)



(台灣啤酒versus金門高粱)

力學(NTOU/MSV, 2018 10-28)



原住民力學班(2018)

國立宜蘭大學土木工程學系 原住民專班

結構學 第1次作業

組別：_____ 學號：_____ 姓名：_____

題目：原住民的工藝在結構力學上的應用



作法：4.全組學生分成五組，並選定一個題目進行。

1.每組給予500元的材料進行成品製作。(實報實銷)

08總指導：國立台灣海洋大學：紀福：00421501

2.於3/8上課時繳交理論分析結果。

4.於3/27上課時繳交成品並進行評分。

(註：關於成品上組人代名 42 張照片特色元素及配色)

評分辦法：1.將紅酒平衡於空中。

2.成品上展現特色元素及配色。

總則：第一名全組學生給予學期總分加分五分及紅酒一瓶(如左圖所示)。

第二名全組學生給予學期總分加分四分。

第三名全組學生給予學期總分加分三分。

第四名全組學生給予學期總分加分二分。

第五名全組學生給予學期總分加分一分。

作品：作品完成後在教室前牆上呈現。

註：感謝國立臺灣海洋大學力學暨振動實驗室提供製作經費及技術支援。

附：原班班第一次作業.doc

力學暨振動實驗室





教學(NTOU/MSV)



My Engng. Math (III), HRE, NTOU 1994



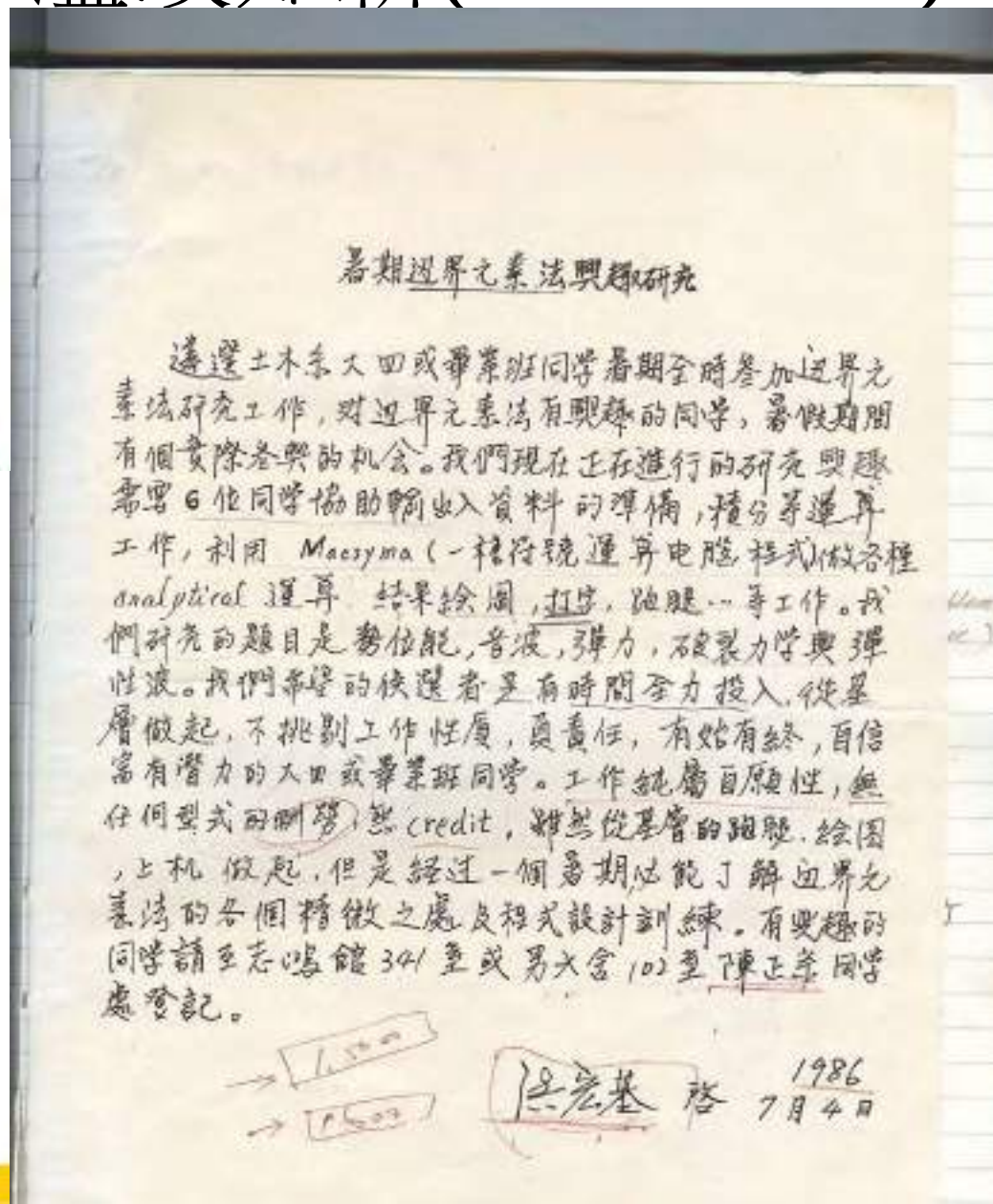
(Jan 23, 1862-1943 複變一人)

(David Hilbert, 1862-1943)



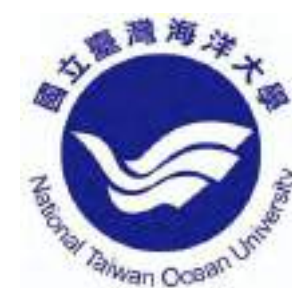
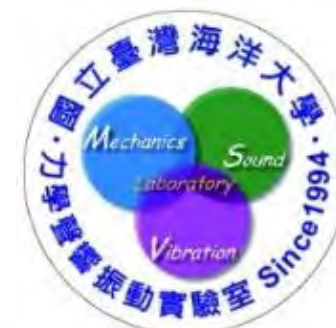


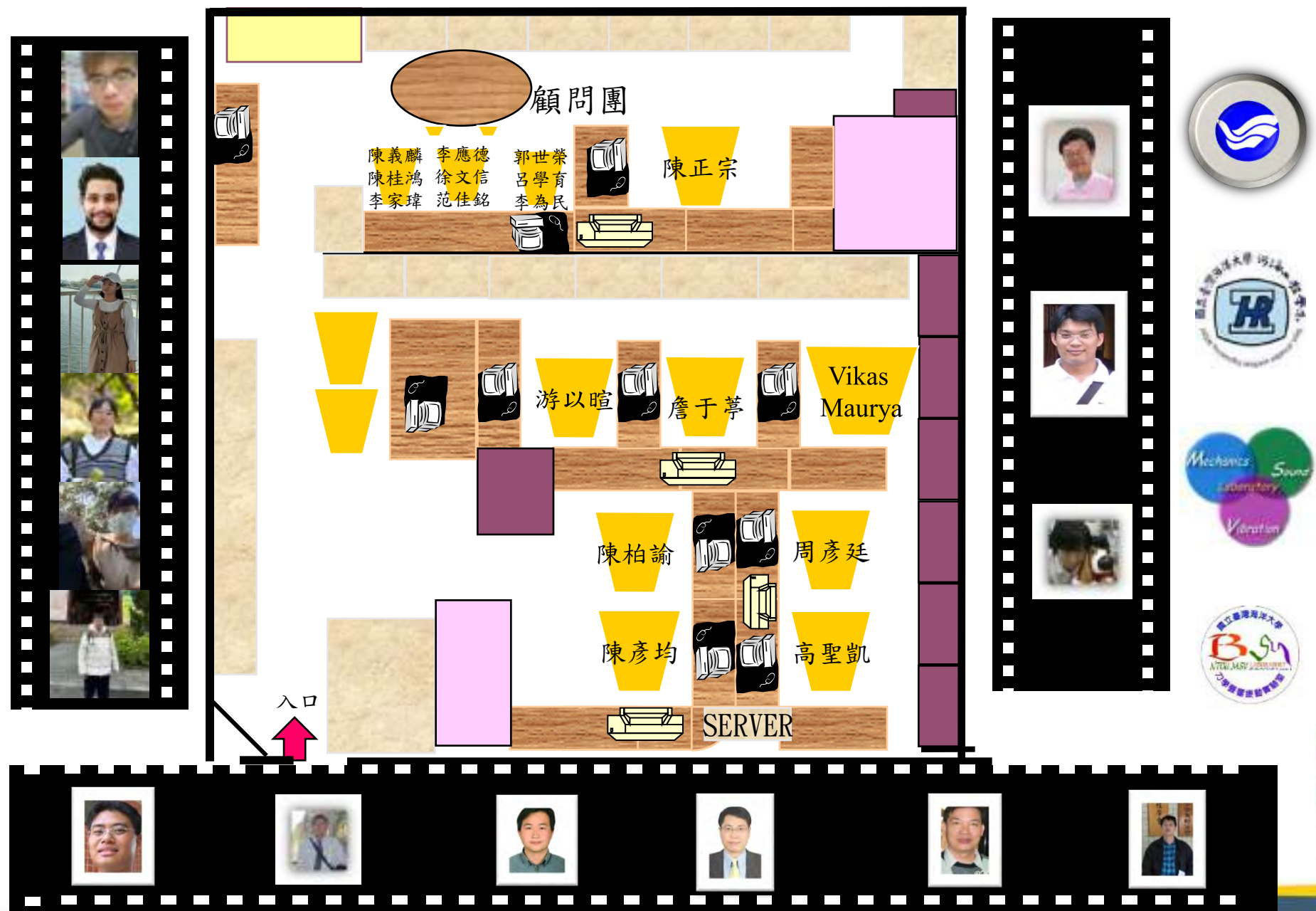
溫故知新(1986-2026)



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







NTOU/MSV members (Sep, 2026)



顧問團領頭羊

工程數學



楊德良
流體力學
FEM



林聰悟
土壤結構互制
計算機
陳宜良
數學
科學計算



洪宏基
固體力學
BEM
劉豐哲
數學
數學分析



陳永祥
動力學
阻尼與振動
張榮語
模流分析
產學



王政盛
流體力學
氣動力學
馮朝剛
空氣動力學
工程數學



李應德



陳義麟



郭世榮



陳正宗



范佳銘



李家璋



高政宏



高聖凱



Vikas Maurya



周彥廷



詹于葶



游以暄



陳彥均

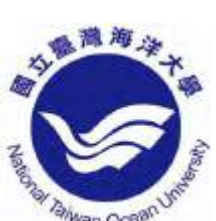


陳柏諭



NTOUMSV IN 2026 SK製表





國科會傑出特約研究員畢業獎 2019



師承宏基邊界元

開創正宗對偶風

三軍五行太極功

鞭辟入裡真輕鬆

領悟零場三分天

分離場源內外通

悖論實虛真面目

只緣身在八卦中

感謝 MSV 家族的每一位。





NTOU MSV的空前？啟後？(1994-2026)



老師

- 國科會第一屆吳大猷獎(土木水利)
- 海大第一屆特聘教授
- 海大終身特聘教授
- 台大土木客座教授
- 成大土木合聘教授
- 海大第一屆特聘講座教授
- 國科會傑出特約研究員獎(土木水利)
- 國科會傑出研究獎(土木水利)
- 國科會工程處土木學門召集人
- 國科會產學處土機海領域召集人
- 教育部學術獎(工科)
- 全球華人杜慶華工程計算方法獎
- 力學期刊最佳論文獎
- 力學學會孫方鐸獎章
- 力學學會會士
- TwSIAM 會士
- 中工會傑出工程教授獎(3)

學生

- 上銀機械論文獎
- 機械學會論文獎
- 振噪學會論文獎第一名
- 力學學會學生論文競賽第一名
- 數學學會傑出大學生獎
- 力學學會博士論文獎
- 國科會大專生計畫創作獎
- 國科會碩士論文獎
- TWSIAM海報論文獎
- 力學期刊最佳論文獎
- 中技社傑出大學生獎
- 中國工程師學會優秀學生獎學金
- ACMT & TwBEM 海報競賽佳作



NTOU/MSV大學生重點人才培養計劃



有前景的未來
傑出的論文成果
自我充實

中華顧問博士班獎學金十萬
中華顧問博士班獎學金三十萬
中華顧問博士班獎學金五萬
中華顧問博士班獎學金六萬

自我充實＝無價

大四上

國科會專題計畫

4000/月

大三下8個月

國科會大專生專題計畫

4000/月

教育部海大卓越計畫暑期專題

大二暑期2個月

9200

橋梁營 程式營 軌道營

中華顧問工程力學營

40000/獲獎者

大二

教育部跨領域培育計畫

No money





研究人才培育往下紮根

溫故知新(2026) money credit





公司級
(中華郵政、中華顧問、上銀科技、中興顧問、宇泰工程)



河工級(修專題)



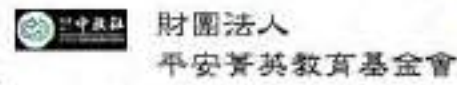
海大級(大暑案)



國家級(科技部大專生案)



學會、基金會級



海峽兩岸級(福州大學、河海大學移地教學)



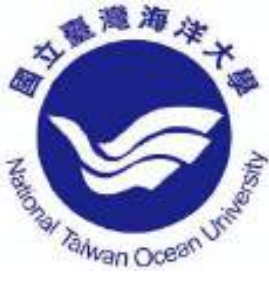
教育部

國際級(出國學習開會)



Mechanics Sound Vibration Laboratory





NTOU/MSV 大學生SCI論文成功案例(1994-2026) 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 method for Cauchy problems (2008)	CM
李家璋****	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
高怡綢	Eigenanalysis for a confocal prolate spheroidal resonator using the null-field BIEM in conjunction with degenerate kernels (2014)	Acta Mechanica
涂雅澍	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
周彥廷	Construction of a curve by using the state equation of Frenet formula (2021)	JOM
戴暉宸	An indirect BIE free of degenerate scales (2021)	CPAA
邵程祥、戴暉宸	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)	JLNVAC
曹美娜	Analytical solutions for the Laplace problem of an eccentric annular domain (2022)	MRC
吳庭安	Are the direct and indirect BEM/BIEMs equivalent ?(2023)	EABE
楊佳穎 & 臧紀甯	Animation of cycloid and spiral curves in companion with instantaneous center 2 of rotation and radius of curvature (2023)	JCIE
楊佳穎	Numerical instability and its treatment for steady state heat conduction problems in exchanger tubes using the dual boundary element method (2023)	NHT
楊佳穎	Analytical study for numerical instability of steady-state heat conduction problems in exchanger tubes using degenerate kernels in the null-field boundary integral equation method (2024)	IJHMT
臧紀甯	Thermal stress analysis of free-free trusses under temperature change using selfregularized approach (2025)	ASCE, JAE



*: 陳桂鴻現任於國立宜蘭大學土木工程學系正教授
**: 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副教授)
***: 李應德現任於國立台灣海洋大學海海工程學系副教授
****: 李家璋現任於淡江大學土木工程學系副教授



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



以前海洋大學部河工學長姊(帥哥美女)做的到，學弟妹們一定行

NTOU/MSV 大學部 SCI 論文發表榮譽榜(1994-2026)



鄭岳世
(ADV, 1996)



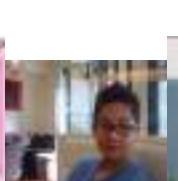
陳桂鴻
(AMM, 1998)



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)



李家璋
(EABE, 2008)



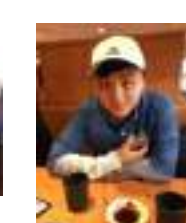
蕭宇志
(ISOPE, 2010)



高怡絹
(Acta Mechanica, 2014)



涂雅潔
(CS, 2014)



黃乙玲
(AML, 2019)



邵程祥
(JOM, 2021)
(EABE2021)



呂政軒
(JOM, 2021)



戴緯宸
(CPAA, 2021)
(EABE2021)



周彥廷
(EABE2021)
(JOM2021)



高浩真
(JLFNVAC, 2022)



曹美娜
(MRC, 2022)



吳庭安
(EABE, 2023)



楊佳穎
(JCIE, 2023)
(NHT, 2023)
(IJHMT, 2024)



臧紀甯 (JCIE, 2023)
臧紀甯 (ASCE, JAE, 2025)



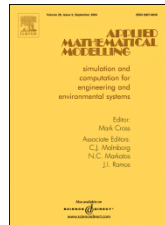
-目前已有27篇文章刊登，遍及20種期刊-

NTOU MSV 大學生SCI論文成功案例(1984-2026) 小兵立大功

SCI



1996 鄭岳世



1998 陳桂鴻



2000 劉立偉



2002 林盛益



2014 涂雅瀨



2018 陳聖劭



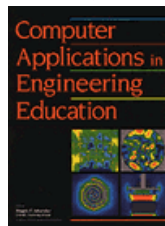
2021 周彥廷 2022 曹美娜
2021 邵程祥 呂政軒



2023 楊佳穎 臧紀甯



臧紀甯 (ASCE, JAE, 2025)



2008 蔡明宏
2008 高聖凱



2008 吳國倫



2010 蕭宇志



2014 高怡綢



2016 涂雅瀨



2004 葉雅婷
2008 謝正昌
2008 李家瑋
2008 余尚儒
2021 周彥廷 2021 邵程祥
2023 吳庭安



2021 戴暉宸



2022 高浩真



2023 楊佳穎



2023 楊佳穎

有為者，亦若是





中華民國數學會 傑出大學生獎 2024

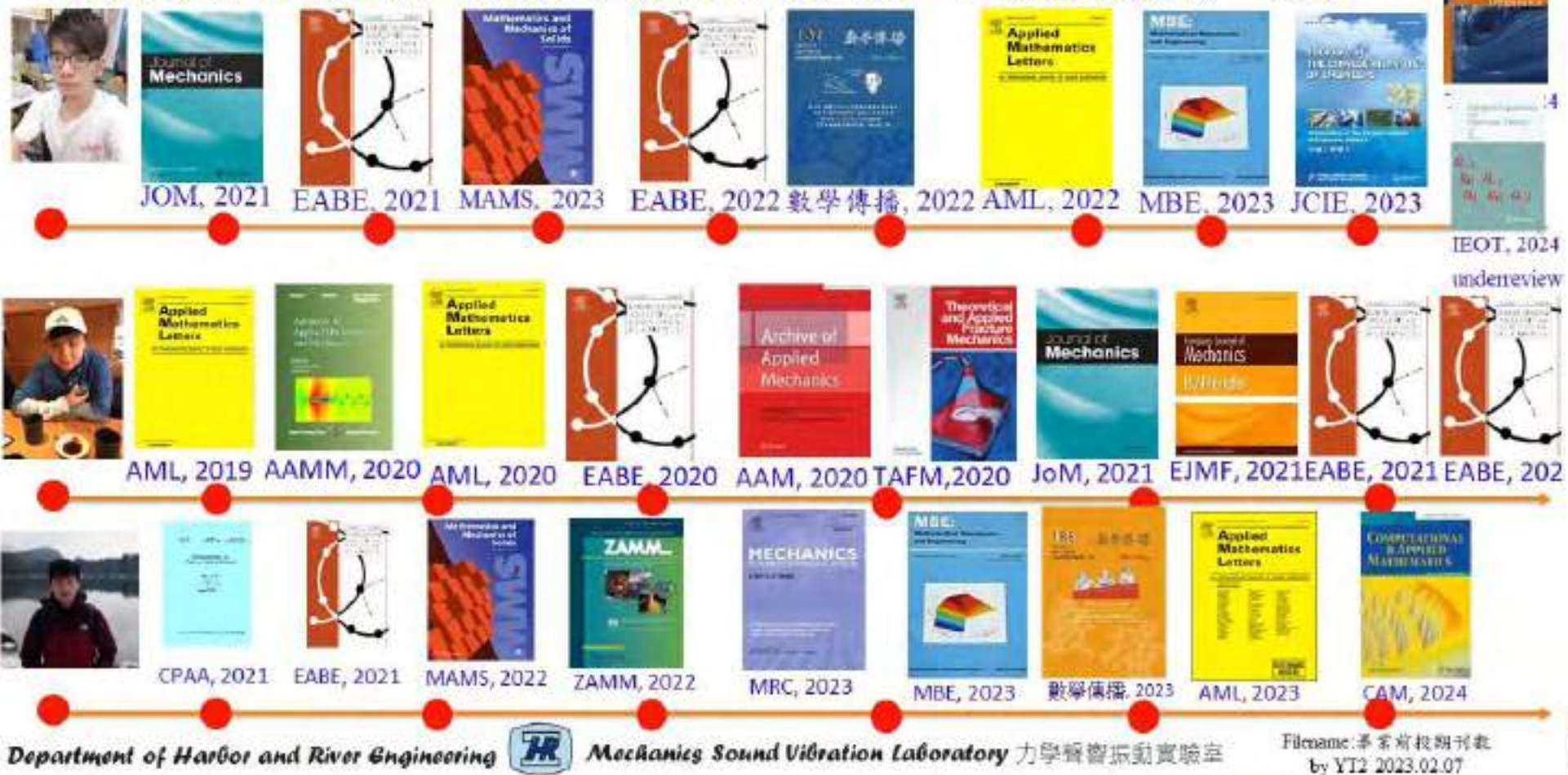


Page 3





NTOU/MSV 有伴真好 周彥廷 黃乙玲 戴暉宸 學碩發表期刊一覽表



Department of Harbor and River Engineering



Mechanics Sound Vibration Laboratory 力學聲響振動實驗室

Filename: 季家前投期刊表
by YT2 2023.02.07



NTOUMSV created four PHDs



照片				
姓名	陳義麟	陳桂鴻	李應德	李家璋
學士學歷	海大輪機系	海大河工系	海大河工系	海大河工系
碩士學歷	海大航技系	海大河工系	海大河工系	海大河工系
博士學歷	海大河工系	海大河工系	海大河工系	海大河工系
服務單位	高雄科技大學 造船及海洋工程系 教授兼電算中心主任	宜蘭大學 土木工程學系 教授系主任	海洋大學 河海工程學系 副教授	淡江大學 土木工程學系 教授



026/10/28

MSV created master and PHD university



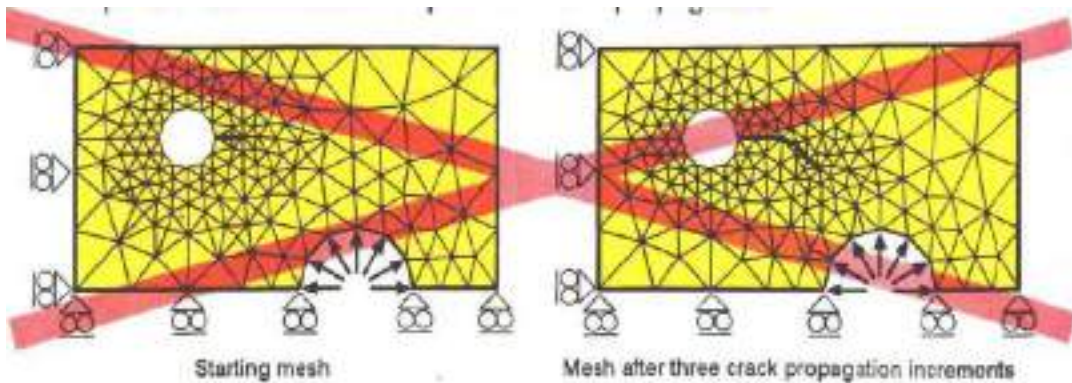
照片						
姓名	陳誠宗	鍾瑜隆	劉立偉	吳清森	高政宏	林書睿
學士學歷	海大河工系	逢甲交管系	海大河工系	逢甲土木系	雲科營建系	中原土木
碩士學歷	海大海科所	海大河工系	海大河工系	海大河工系	海大河工系	海大河工系
博士學歷	成大水利系	交大土木系	台大土木系	台大土木系	成大水利系	台大機械
服務單位	三明學院 副教授	武夷學院 土木工程學院 副教授	國立台灣大學 土木工程學系 副教授	國立宜蘭大學 土木工程學系 教授	高雄科技大學 土木工程學系 助理教授	核能研究所工 程師/龍華科 大





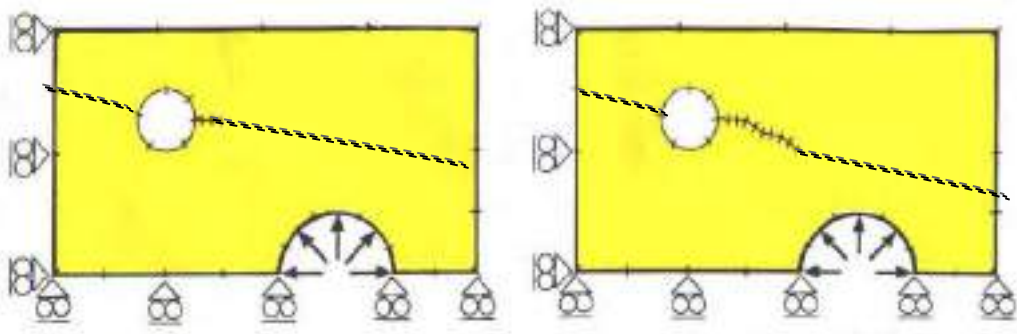
研究(NTOU/MSV)

裂縫成長 Crack growth



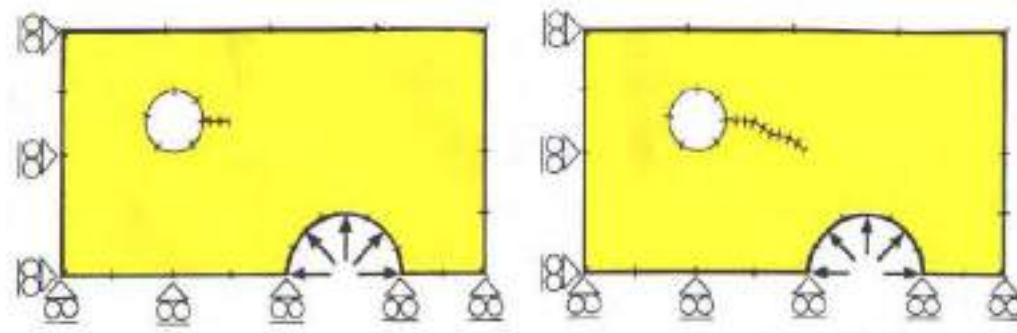
FEM since 1963

Remesh near tip



BEM since 1969

Subdomain BEM, 1981, Ingraffea



Dual BEM (MIT) since 1986

Hong and Chen, 1988

Chen and Hong, 1999



ASME AMR Taiwan NTOUMSV 2026

Impact Factor 12.2



1986



鮑亦興(台大應力)

1999



陳正宗(海大河工)

2000



陳發林(台大應力)

2003



楊永斌(台大土木)

202?



洪宏基(台大土木)



姚忠達(淡大建築)

江山待有
才人出?





Table G2 NTOU/MSV Google citing 10篇破百 (Sep 14, 2026)

Research Gate Scores: 45 h index:41 (Scopus)

1999	J. T. Chen and H.-K. Hong, 1999, Review of dual boundary element methods with emphasis on hypersingular integrals and divergent series, Applied Mechanics Reviews, ASME, Vol.52, No.1, pp.17-33.	518
1988	H.-K. Hong and J. T. Chen, 1988, Derivations of Integral Equations of Elasticity, Journal of Engineering Mechanics, ASCE, Vol.114, No.6, pp.1028-1044.	481
2007	J. T. Chen, C. S. Wu, Y. T. Lee and K. H. Chen, 2007, On the equivalence of the Trefftz method and method of fundamental solutions for Laplace and biharmonic equations, Computers and Mathematics with Applications, Vol.53, No.6, pp.851-879.	146
1998	J. T. Chen and F. C. Wong, 1998, Dual formulation of multiple reciprocity method for the acoustic mode of a cavity with a thin partition, J. of Sound and Vibration, Vol. 217, No.1, pp.75-95.	137
2004	JT Chen, IL Chen, KH Chen, YT Lee, YT Yeh, 2004, A meshless method for free vibration analysis of circular and rectangular clamped plates using radial basis function, Engineering Analysis with Boundary Elements Vol.28, No.5, 535-545.	113
2002	J. T. Chen, S. R. Kuo and J. H. Lin, 2002, Analytical study and numerical experiments for degenerate scale problems in the boundary element method for two-dimensional elasticity, Int. J. Numer. Meth. Engng., Vol.54, No.12, pp.1669-1681.	112
2008	J. T. Chen, P. Y. Chen and C. T. Chen, 2008, Surface motion of multiple alluvial valleys for incident plane SH-waves by using a semi-analytical approach, Soil Dynamics and Earthquake Engineering,, Vol.28, pp.58-72.	108
2002	JT Chen, MH Chang, KH Chen, SR Lin, The boundary collocation method with meshless concept for acoustic eigenanalysis of two-dimensional cavities using radial basis function , Journal of Sound and Vibration Vol.257, No.4, 667-711	108
2001	J. T. Chen, J. H. Lin, S. R. Kuo and S. W. Chyuan, 2001, Boundary element analysis for the Helmholtz eigenproblems with a multiply-connected domain, Proc. Royal Society of London Ser. A, Vol.457, No.2014, pp.2521-2546.	104
2003	J. T. Chen, L. W. Liu and H.-K. Hong, 2003, Spurious and true eigensolutions of Helmholtz BIEs and BEMs for a multiply-connected problem, Royal Society London Series A, Vol.459, No.2036, pp.1891-1925.	103





Table J NTOU/MSV Highly Read 前三強(ResearchGate 46, May 5, 2026)



2003	S. W. Chyuan, Y. S. Liao and J. T. Chen, An efficient method for solving electrostatic problems, IEEE Computing in Science and Engineering, 5(3): 52 – 58.	5,045
2006	J. T. Chen and C. S. Wu, Alternative derivations for the Poisson integral formula, International Journal of Mathematical Education in Science and Technology, 37(2): 165-185.	4,564
2008	W. M. Lee and J. T. Chen, Null-field integral equation approach for free vibration analysis of circular plates with multiple circular holes, Computational Mechanics, 42(5): 733-747.	3,345
2011	W. M. Lee and J. T. Chen, Free Vibration Analysis of a Circular Plate With Multiple Circular Holes by Using Indirect BIEM and Addition Theorem, ASME. Journal of Applied Mechanics, 78(1): 1-10.	2,805
2005	S. S. Lin, J. C. Liao, J. T. Chen and L. Chen, Lateral performance of piles evaluated via inclinometer data, Computers and Geotechnics, 32(6), pp.411-421.	1,498
2009	J. T. Chen, J. N. Ke, H. Z. Liao, Construction of Green's function using null field integral approach for Laplace problems with circular boundaries, Computers, Materials & Continua, 9(2): 93-109.	1,174
2009	J. T. Chen and Y. T. Lee, Torsional rigidity of a circular bar with multiple circular inclusions using a null field integral equations, Computational Mechanics, Vol.44, No.2, pp.221-232.	1,095
2009	J. T. Chen, K. H. Chou and S. K. Kao, Derivation of Green's function using addition theorem, Mechanics Research Communications, Vol.36, No.3, pp.351-363.	1,167
1999	J. T. Chen and H.-K. Hong, Review of dual boundary element methods with emphasis on hypersingular integrals and divergent series, Applied Mechanics Reviews, ASME, Vol.52, No.1, pp.17-33.	912
2007	J. T. Chen and A C Wu, Null-field integral equation approach for multi-inclusion problem under anti-plane shear, ASME, J. Appl. Mech., Vol.74, pp.469-487.	752
2008	J. T. Chen, K. S. Chou and S. K. Kao, One-dimensional wave animation using Mathematica, Computer Applications in Engineering Education, 17(3):323-339.	673
2009	J. T. Chen, M. H. Tsai and C. S. Liu, Conformal mapping and bipolar coordinate for eccentric Laplace problems, Computer Applications in Engineering Education, Vol.17, No.3, pp.314-322.	576
1988	H. K. Hong and J. T. Chen, Derivations of Integral Equations of Elasticity, ASCE Journal of Engineering Mechanics, 114(6):1028-1044.	537





Citing: Chen J T On Hadamard principal value
and boundary integral equation of fracture mechanics
M. Sc. Thesis (第一屆應力所碩士論文)
Institute of Applied Mechanics, National Taiwan University, 1986.
(洪宏基教授指導)

Plenary lecture
St. Petersburg
FEM/BEM 2003
(列寧格勒)

Google: 481 Google: 518



Hong and Chen, 1988 ASCE-EM
Chen and Hong, 1999 ASME-AMR







Stanford Top 2% Civil professor



Applied physics



陳東陽

Applied math



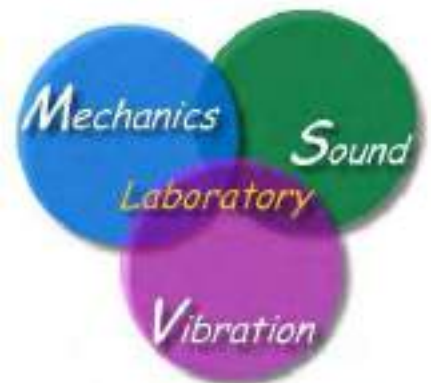
陳正宗

Piezoelectricity-----0.29%

Stanford rank745 -----0.49%

Boundary Element method-----0.23%

Stanford rank174 -----0.77%



NTOU HRE

海洋大學



陳正宗
特聘講座教授

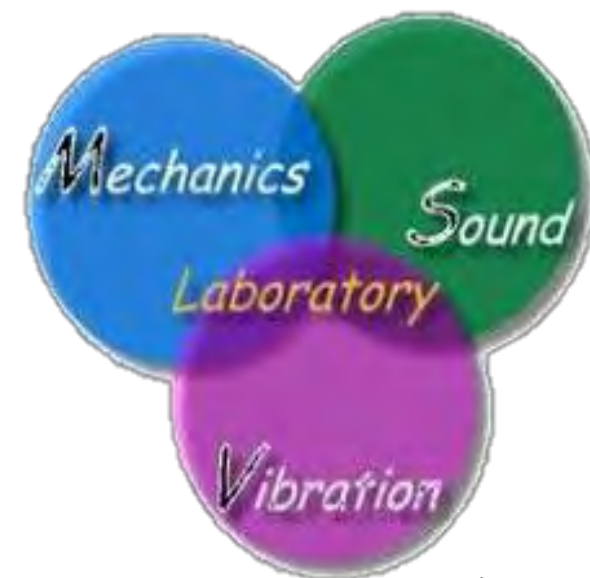


陳正宗 客座教授
(2022-2023)



台灣大學

陳正宗
客座教授



陳正宗 合聘教授
(2018~)



成功大學

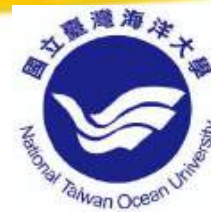
陳正宗
合聘教授



國立臺灣海洋大學河工系 (1994-2026)

NTOU Campus





一人聘任 三人服務 學術三代傳承 (2023)



劉立偉助理教授
(2022台大聘任)



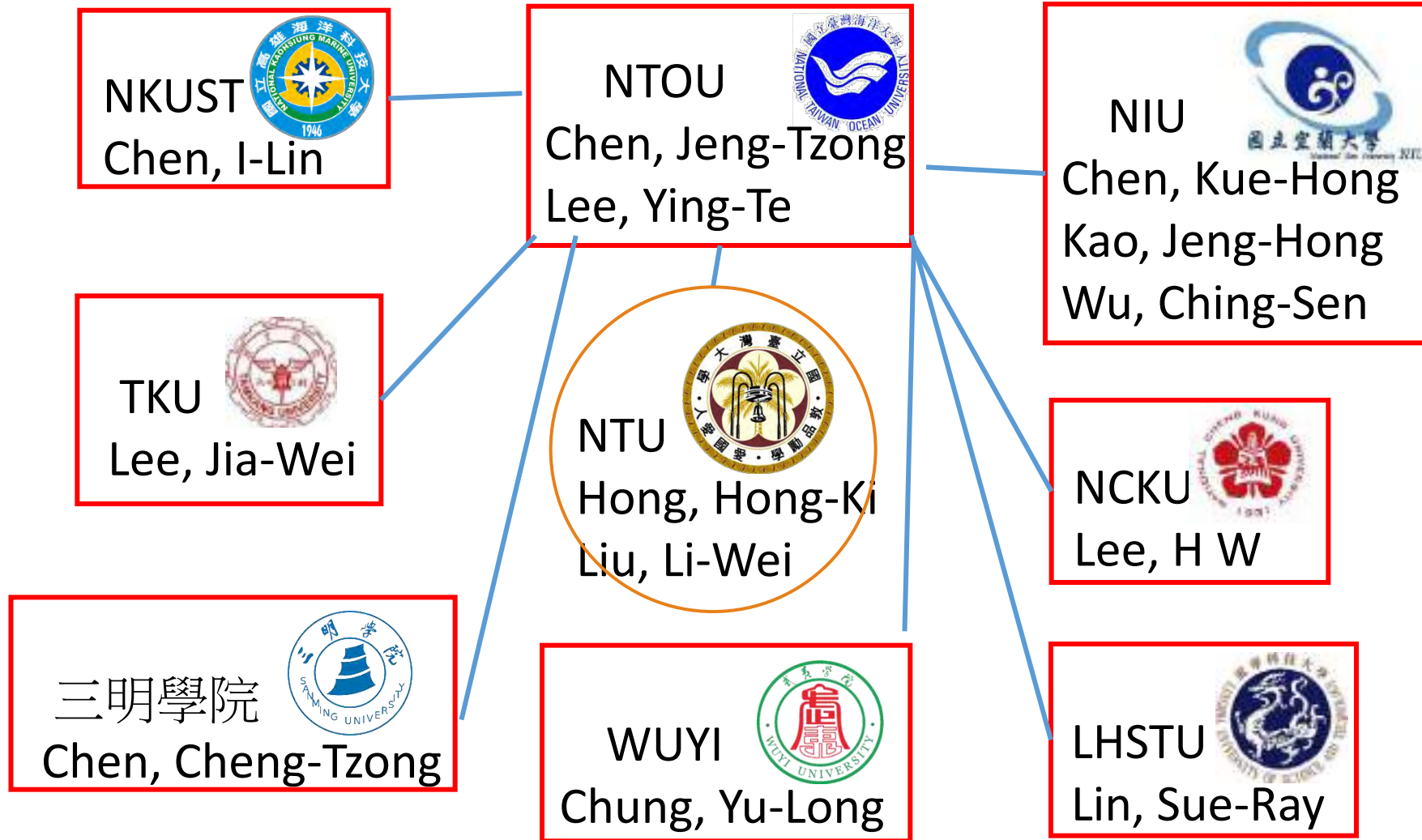
洪宏基終身特聘教授
(2023台大退休)
一年)



海大陳正宗特聘講座教授
(2022-2023 台大客)

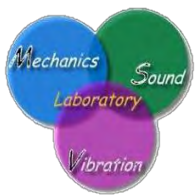


Global MSV Family since 1982





計算(NTOU/MSV)



計算硬體capability與計算軟體efficiency (硬體軟體本一家 分不開)

鮑亦興院士(1930-2013)



1. 計算硬體

How old are you ? 計算尺 >70

求積儀 >60

算盤 求積儀 計算尺

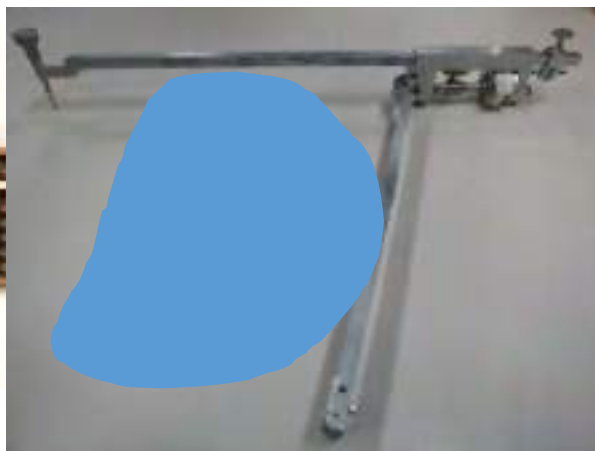
計算機 VAX8600 電腦



鮑老師畢其一生發表了 118 篇論文，前三十篇就是靠這隻計算尺搖出來的!!!
(NTOU/MSV 傳承)



珠算口訣 +1 - 5 (-4)



1930年1月－2013年6月18日
([上海交通大學](#) [台灣大學](#))

求積儀 (Gauss 定理 從邊繞來算 面積分>>>線積分)



計算硬体capability與計算軟體efficiency

算則的重要(Numerical algorithm)

邊界的觀念

$1+2+...+100$ (土法煉鋼 >>> Gauss 從頭尾和算)

處處是高斯?

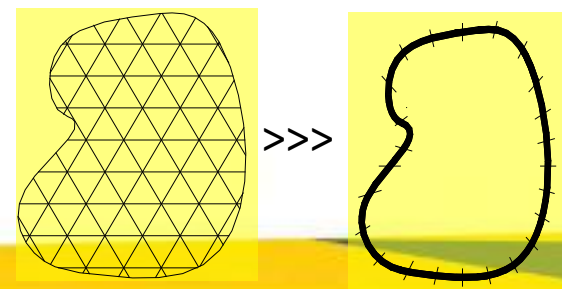


算面積

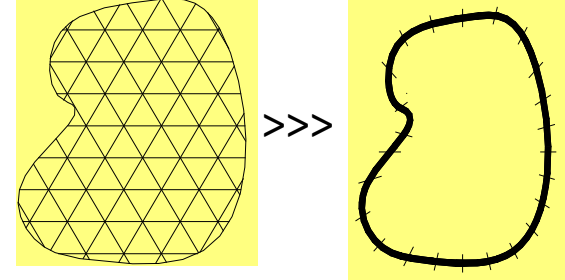


求積儀 (Gauss 定理 從邊繞來算 面積分>>>線積分)

有限元素法(FEM >>> BEM)邊界元素法



求積儀 VCR

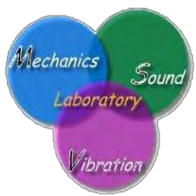


求積儀 (Gauss 定理 從邊繞來算 面積分>>>線積分)

有限元素法(FEM >>> BEM)邊界元素法

算面積





求積儀(3.14159) 台北科教館 March 14, 2021



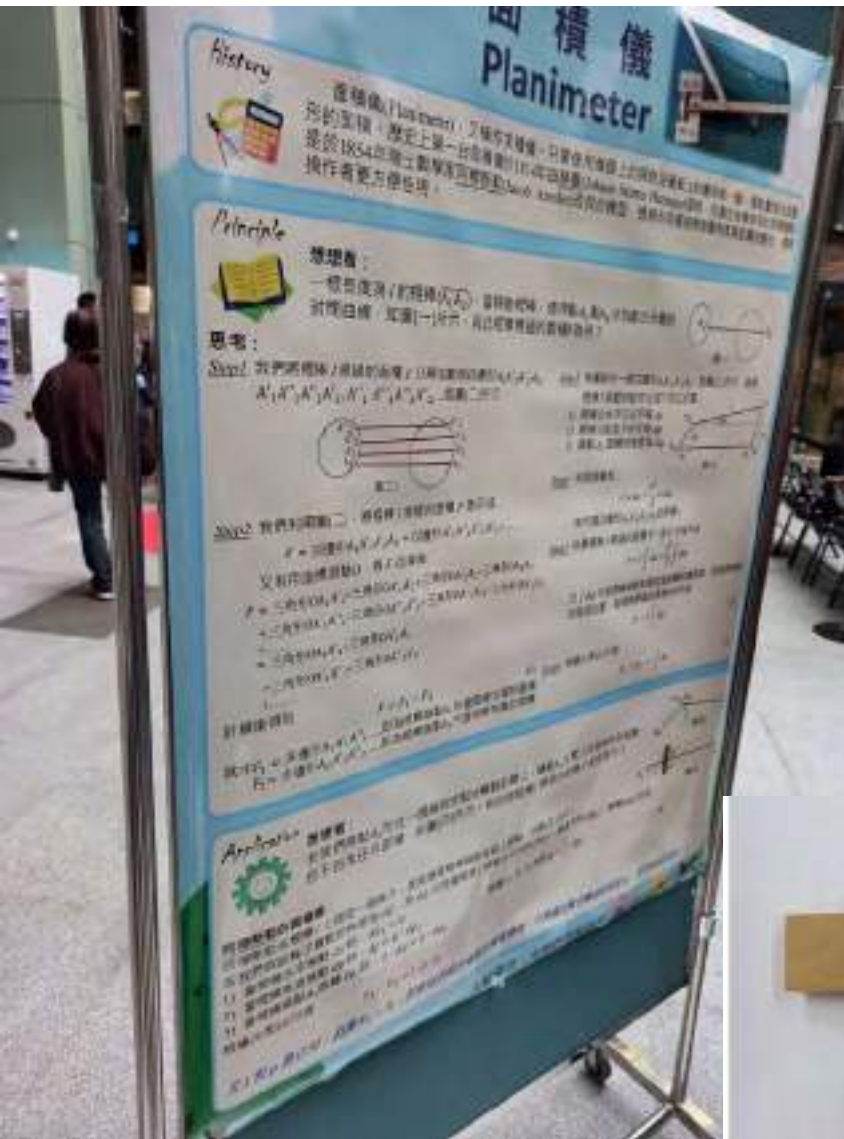
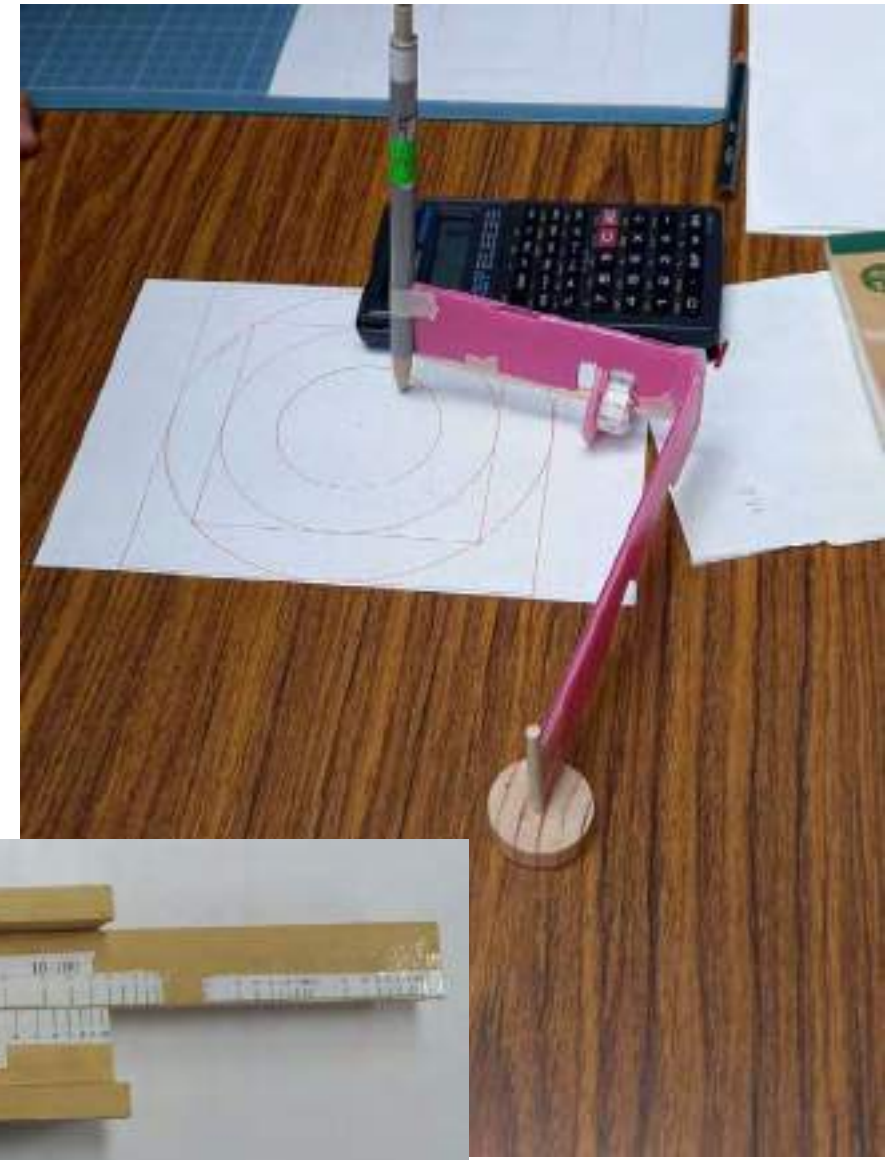
https://sites.google.com/g2.nctu.edu.tw/taiwan314/?fbclid=IwAR0z0N1K3zFDsFmBbhbCnm2GQAB_v1HB4Sol7vTGM2N3-exs6SBYWqX3NOK

求積儀怎麼用?

幫助發明大王愛迪生解決使用蒸汽機指示器
衍生的面積問題

林俊吉教授
中華民國數學會副理事長

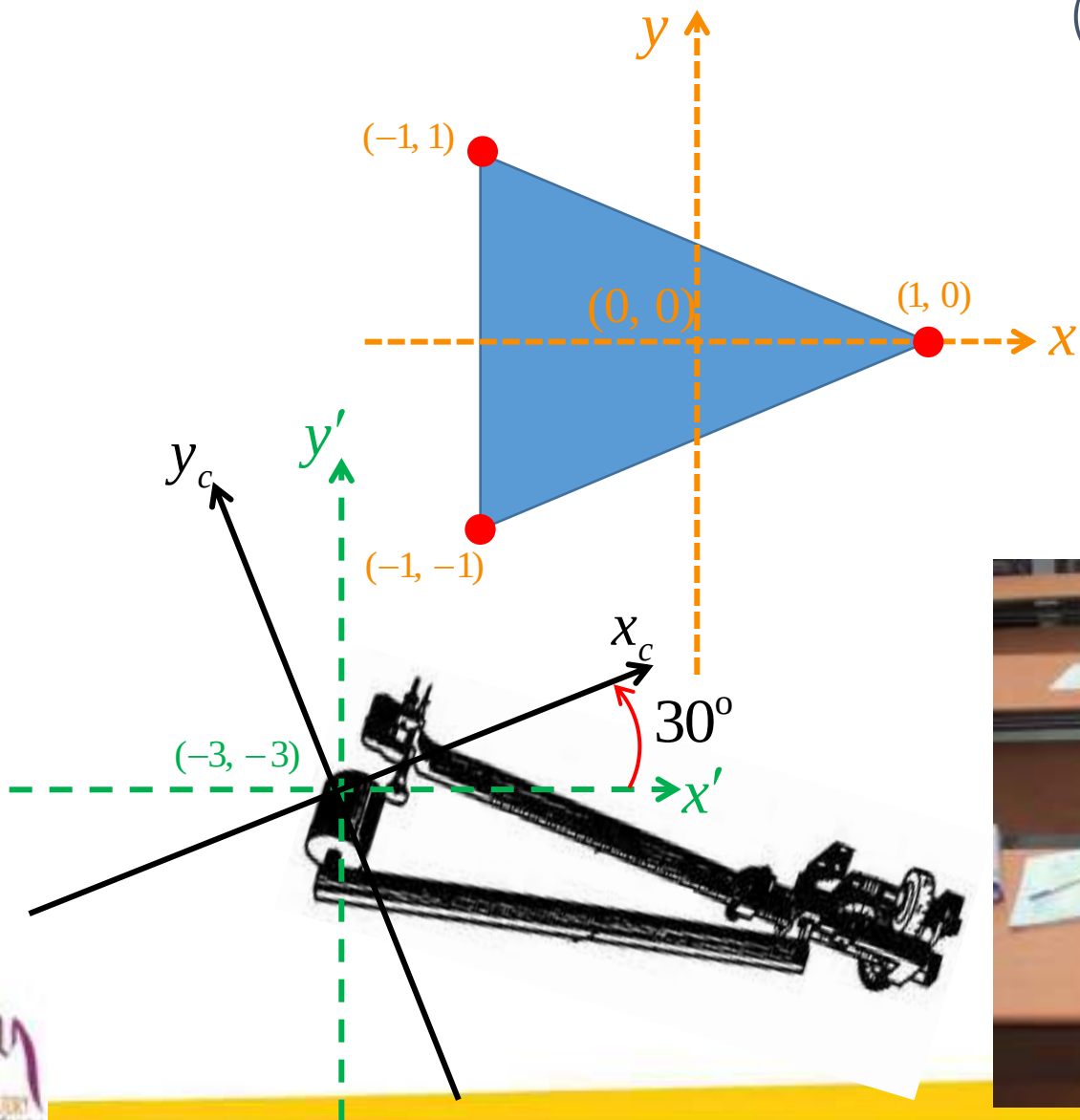
求積儀(3.14159) 台北科教館 March 14, 2021



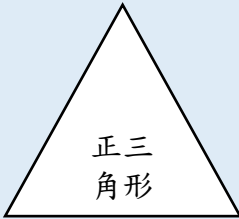
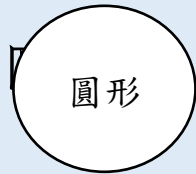
求積儀客觀性(求積儀隨便擺)

(Frame indifference and objectivity)

$$\begin{aligned} A &= \frac{1}{2} \oint x dy - y dx \\ &= \frac{1}{2} \oint x' dy' - y' dx' \\ &= \frac{1}{2} \oint x_c dy_c - y_c dx_c \end{aligned}$$

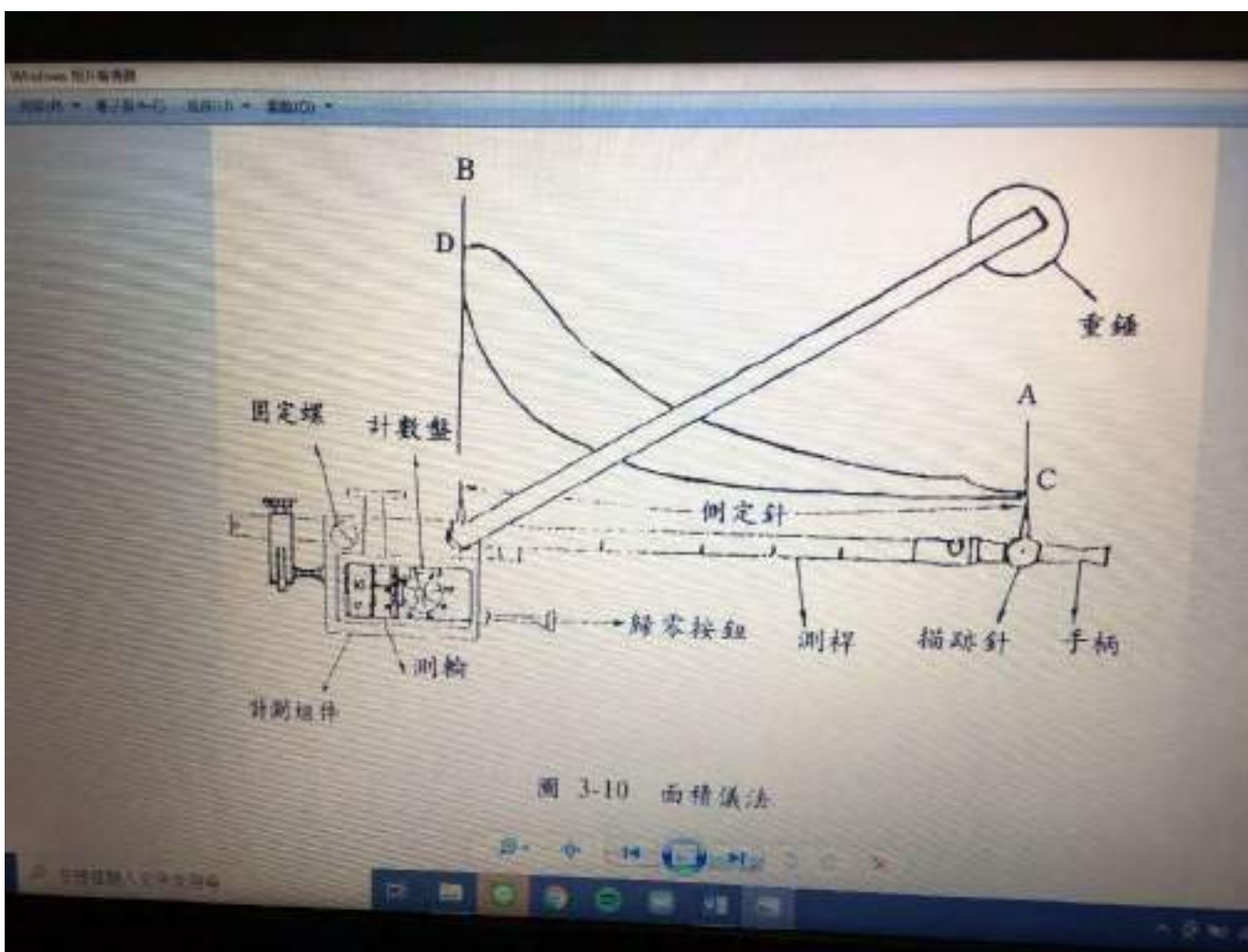


求積儀繞一圈計算面積-(2013力學營學員分享)

圖形	面積 (用計算機計算)	求積儀繞一圈	
 橢圓	長軸=1.25cm 短軸=0.8cm 計算: $1.25 \times 0.8 \times \pi = 3.14cm^2$	3.112cm ²	
		面積誤差	0.028cm ² (0.892%)
 長方形	長=2.2cm 寬=1.25cm $2.2 \times 1.25 = 2.75cm^2$	2.867cm ²	
		面積誤差	0.117cm ² (4.081%)
 正三角形	$\frac{\sqrt{3}}{4} (2)^2 = 1.732cm^2$ (邊長:2cm)	1.725cm ²	
		面積誤差	0.007cm ² (0.404%)
 圓形	直徑:1.9cm $\frac{\pi}{4} (1.9)^2 = 2.835cm^2$	2.819cm ²	
		面積誤差	0.016cm ² (0.564%)

感謝中華顧問
每年贊助150 萬
舉辦力學營
(2010-2016)

中華顧問工程公司
CHINA ENGINEERING CONSULTANTS, INC.



輪機在船上:早期在計算指示馬力
(海大輪機系友 NTOU/MSV 陳義麟博士 提供)
(台大造船辛敬業繪製船圖 計算船體幾何特性)



1. 台大土木系 (陳正宗 1984畢)

大二測量實習算醉月湖面積

2. 台大造船系 (辛敬業 1982畢)

大四繪製船圖時，進行各種幾何特性計算

3. 海大輪機系 (陳義麟 1977畢)

輪機課時計算船體指示馬力

4. 台大數學系 (陳宜良 1975畢)

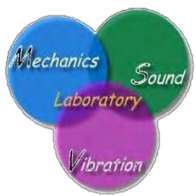
Mechanical calculation

5. 台大農藝系 (磯永吉教授 Iso 先生 1886-1972)



感謝Phi Tau Phi 學會贊助演講，獲得以上交流成果

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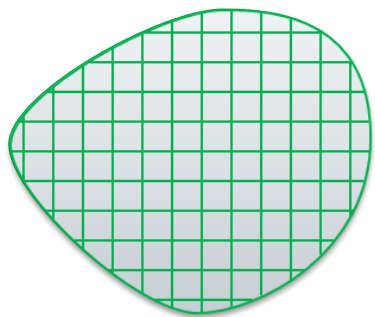
邊界元走過四十年 (1984-2026)



Why BEM (Advantage)

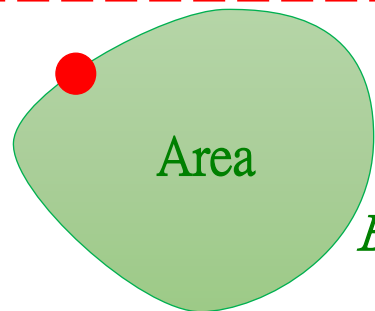
B

$1+2+3+\dots+100=?$



Planimeter

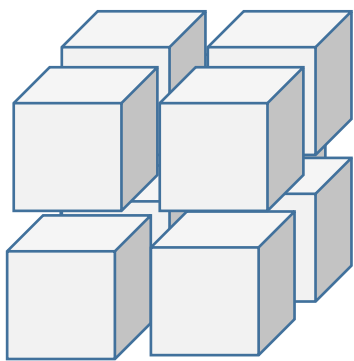
$$\frac{(1 + 100) \times 100}{2}$$



Gauss

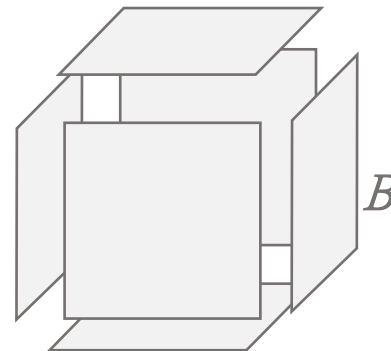


搞計算教工數 一輩子
逃不了 高斯的手掌心

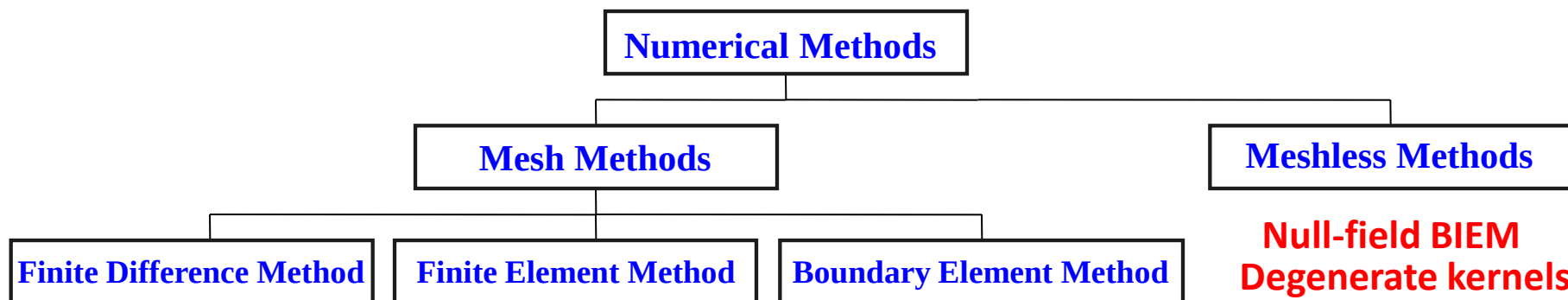
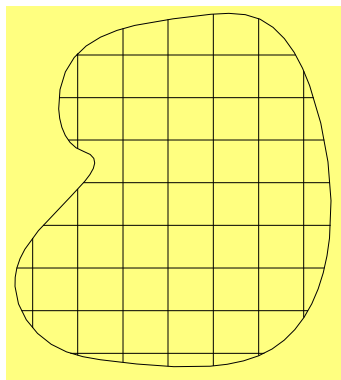


3D $\xrightarrow{\text{BEM}}$ 2D

Gauss' theorem
Green's identities
Somigliana identity

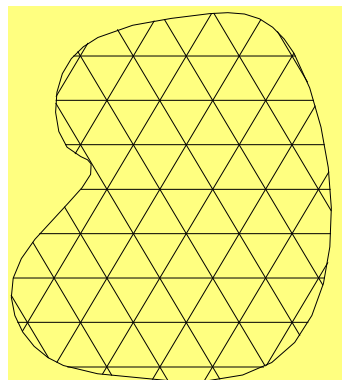


Overview of numerical methods



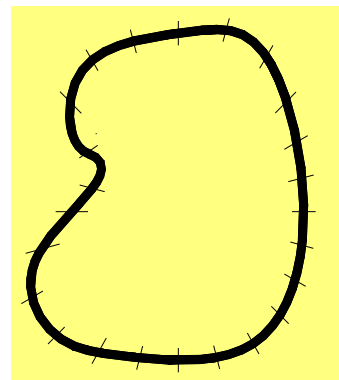
Difference Equation

開刀



PDE- variational

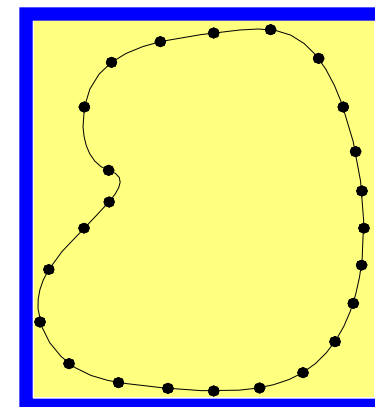
把脈



Integral Equation



針灸



Null-field BIEM
Degenerate kernels



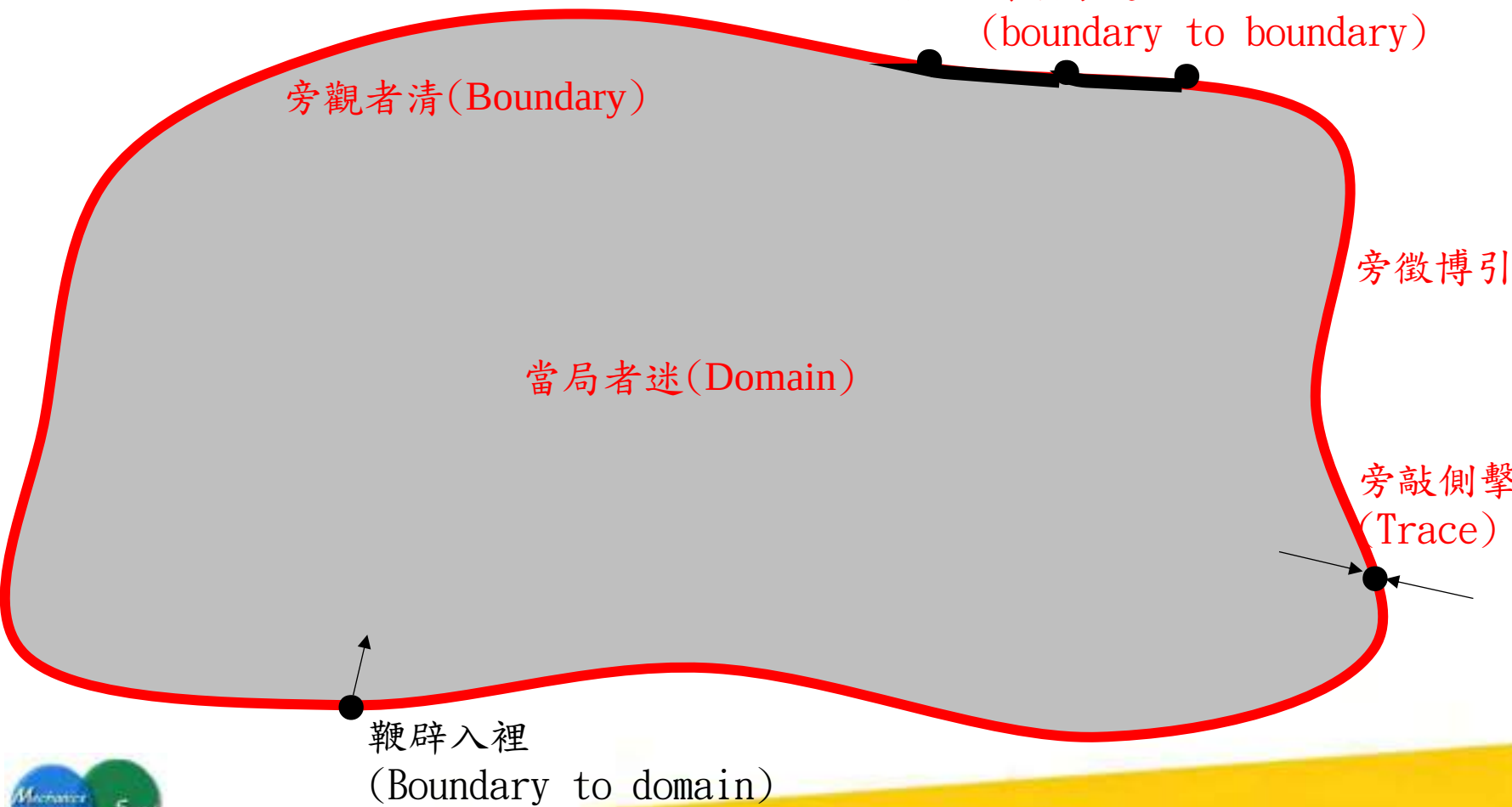
BEM/BIEM與`辟(B)`法 邊界元素法 境界要素法



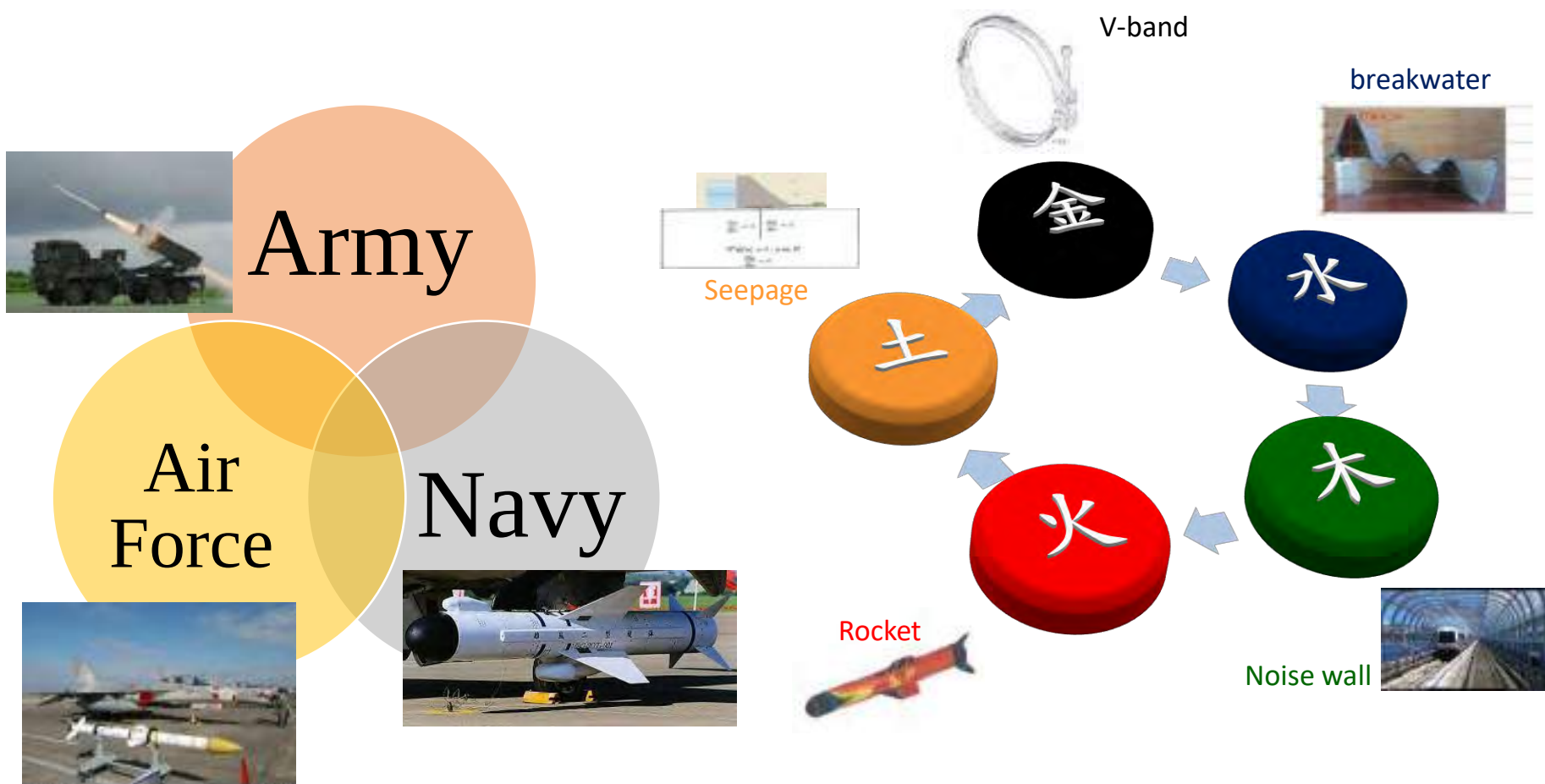
鞭辟入里 側擊 辟 壁 僻 避 臂 觸 通 引 旁 當局者迷 旁觀者清 徵博 類通 B SM NTU MSU LABORATORY SERVICES 1994

Edited by
J T Chen & S K Kao

邊界元素法精神

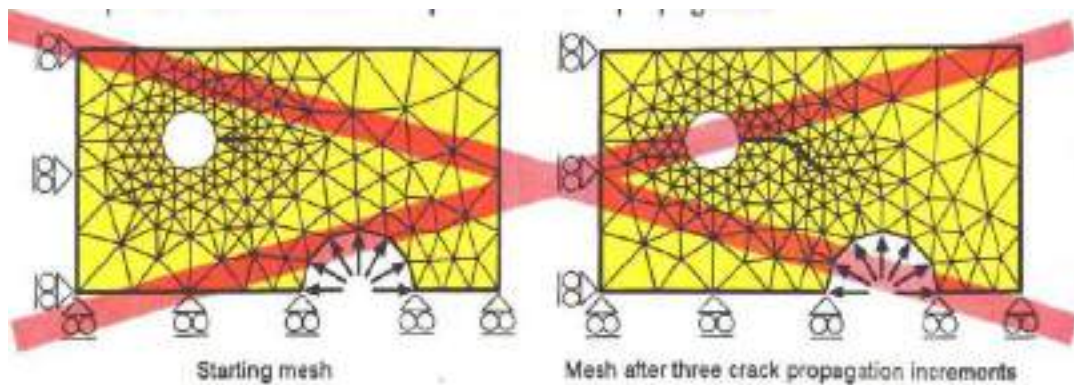


Paradise 三軍五行



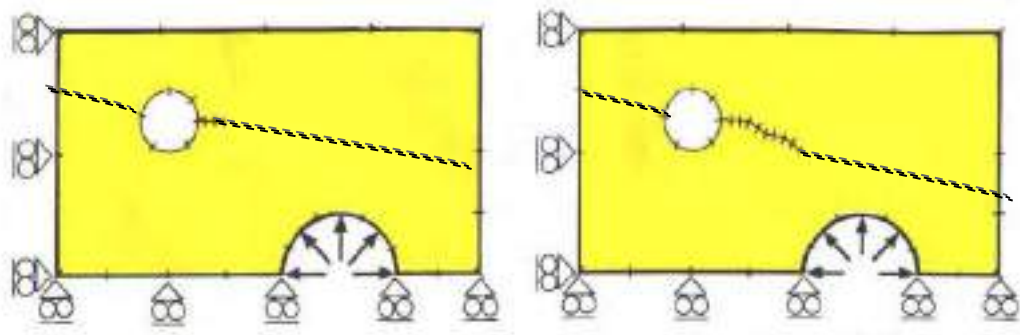
Underwater Submarine (2025)

裂縫成長 Crack growth



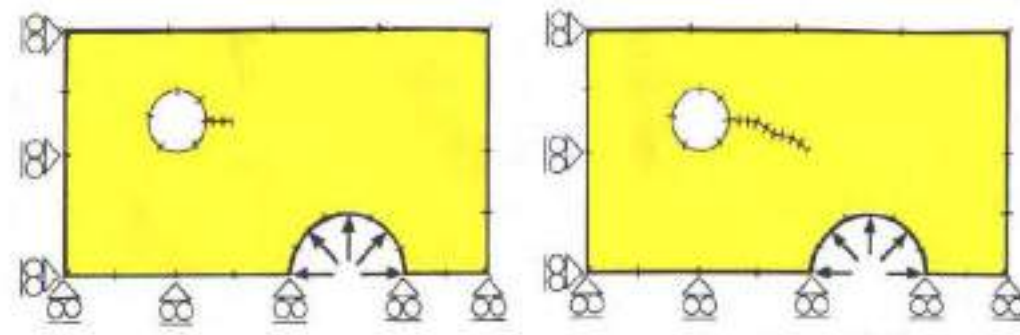
FEM since 1963

Remesh near tip



BEM since 1969

Subdomain BEM, 1981, Ingraffea



Dual BEM (MIT) since 1986

Hong and Chen, 1988

Chen and Hong, 1999

Seepage (sheet pile), MIT, 1989

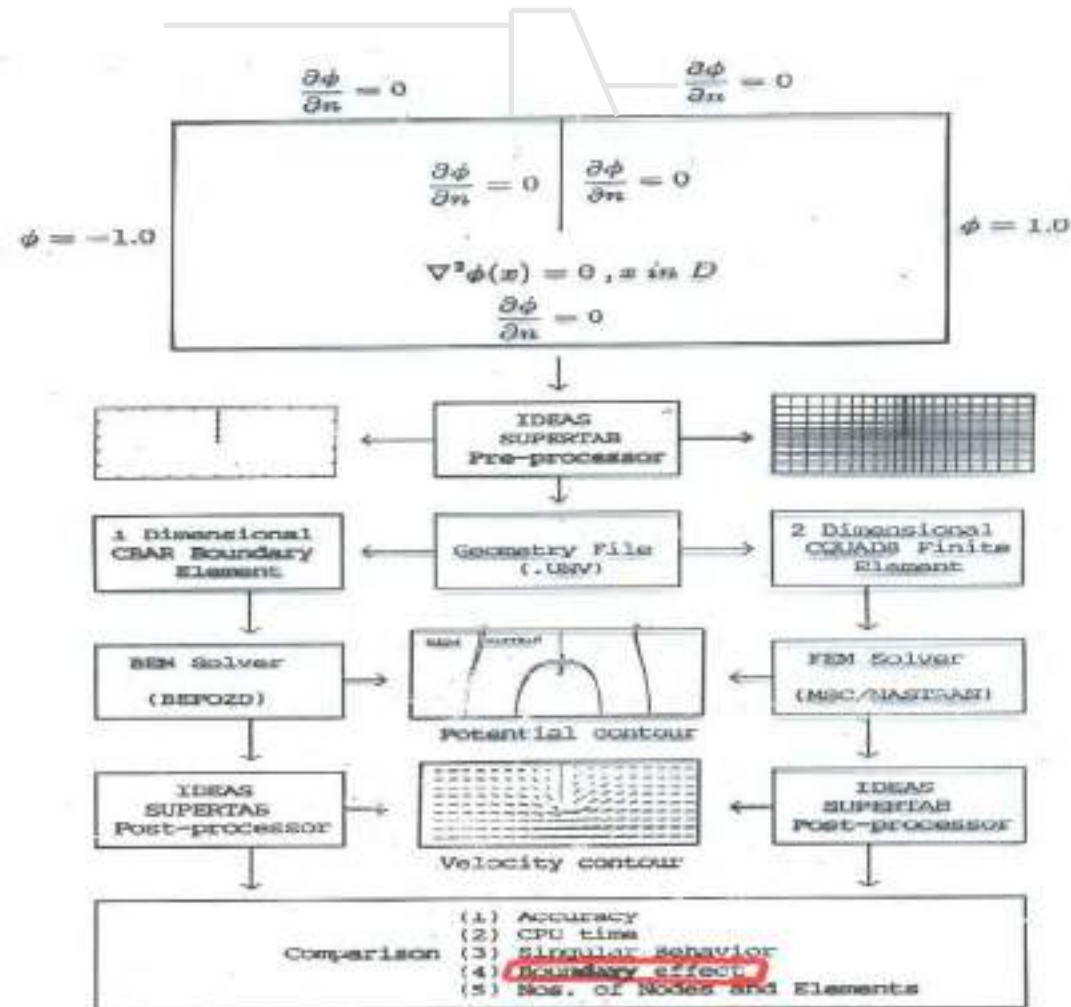
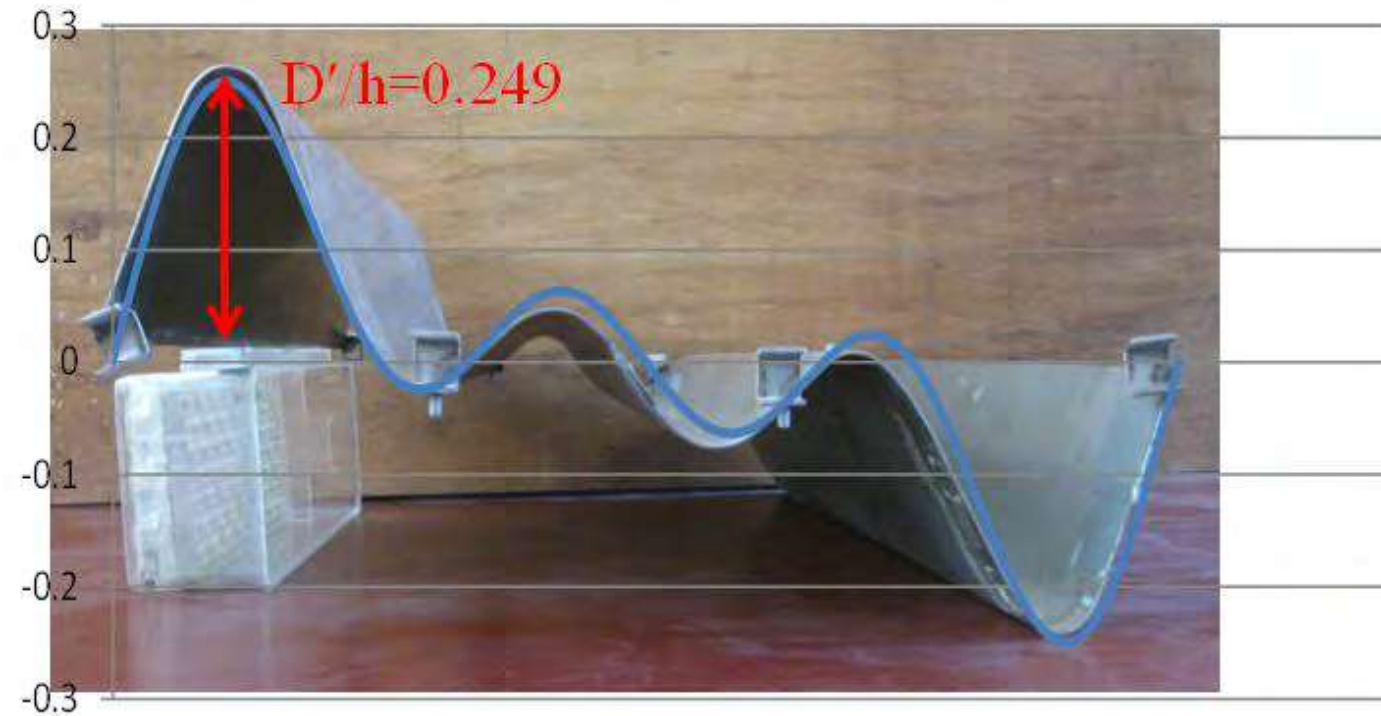
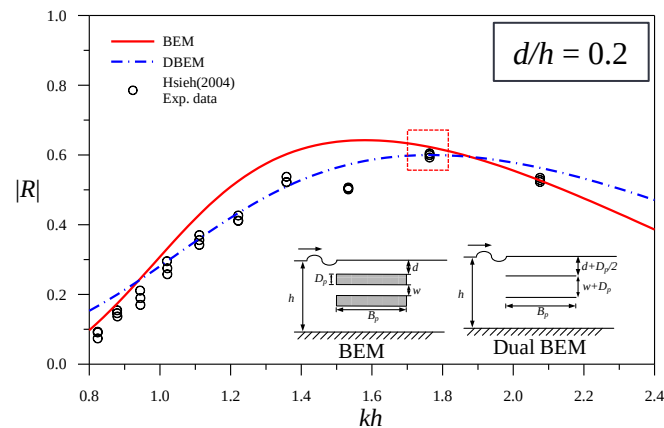
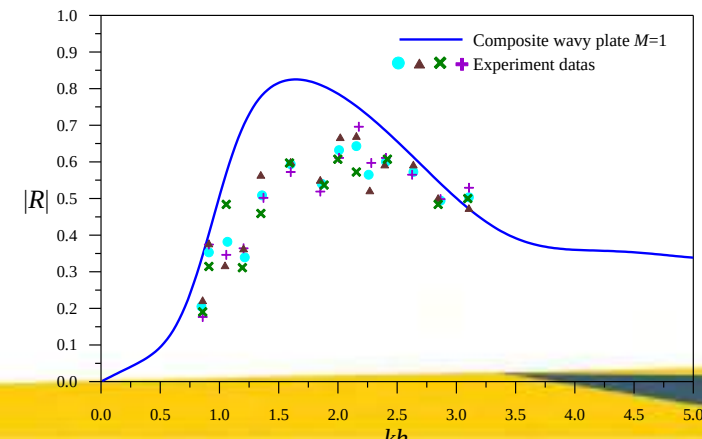


Fig.4 Flowchart of BEM and FEM solver system.

Thin breakwater
(degenerate
boundary)



W K Weng and C Y Yueh
(1.7-mm thick)



OCEAN Lab at HRE, NTOU (Weng W K)





數學(NTOU/MSV)

Dual Integral Equations by Hong and Chen(1984-1986)

Singular integral equation $\longrightarrow$ Hypersingular integral equation

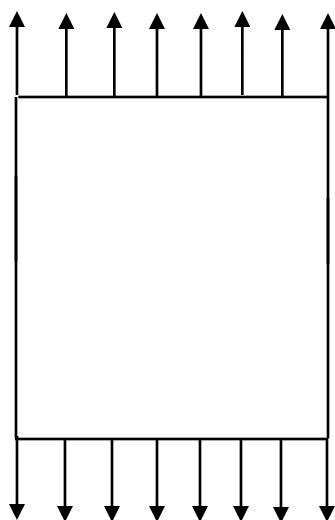
Cauchy principal value $\longrightarrow$ Hadamard principal value

(Mangler principal value)

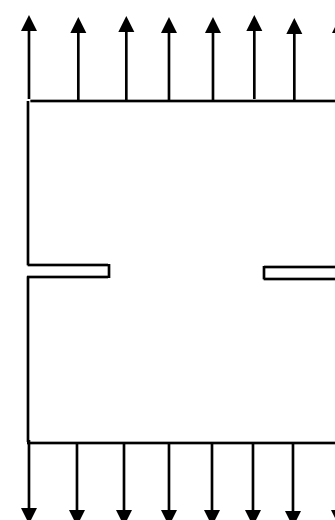
Boundary element method $\longrightarrow$ Dual boundary element method

1969

normal
boundary

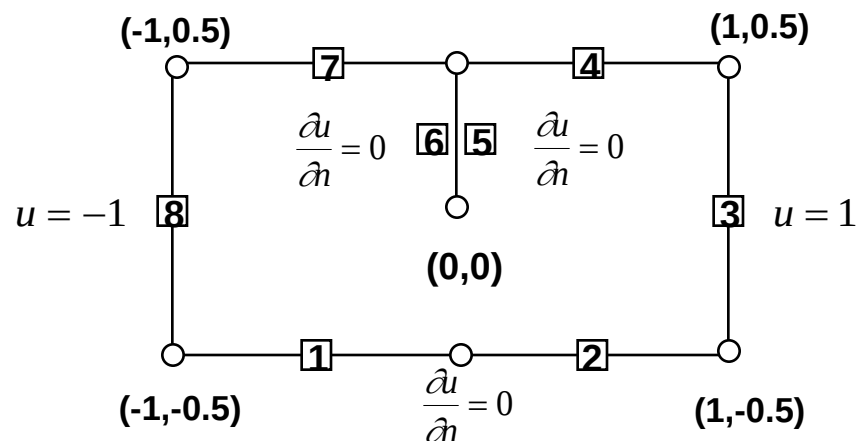


1986



degenerate
boundary

Degenerate boundary



- geometry node
- the Nth constant or linear element

$$[U]\{t\} = [T]\{u\}$$

$$[L]\{t\} = [M]\{u\}$$

5(+) 6(+)

$$[U] = \begin{bmatrix} -1.693 & -0.045 & 0.471 & 0.347 & -0.054 & -0.054 & 0.039 & -0.335 \\ -0.045 & -1.693 & -0.335 & 0.039 & -0.054 & -0.054 & 0.347 & 0.471 \\ 0.445 & -0.335 & -1.693 & -0.335 & 0.019 & 0.019 & 0.445 & 0.703 \\ 0.347 & 0.039 & -0.335 & -1.693 & -0.281 & -0.281 & -0.045 & 0.471 \\ -0.081 & -0.081 & 0.063 & -0.638 & -1.193 & -1.193 & -0.638 & 0.063 \\ -0.081 & -0.081 & 0.063 & -0.638 & -1.193 & -1.193 & -0.638 & 0.063 \\ 0.039 & 0.347 & 0.471 & -0.045 & -0.281 & -0.281 & -1.693 & -0.334 \\ -0.335 & 0.445 & 0.703 & 0.445 & 0.019 & 0.019 & -0.335 & -1.693 \end{bmatrix}$$

5(+) 6(+)

$$[L] = \begin{bmatrix} \pi & 0.000 & 0.184 & 0.519 & 0.458 & 0.458 & 0.927 & 0.805 \\ 0.000 & \pi & 0.805 & 0.927 & 0.458 & 0.458 & 0.519 & 0.184 \\ 0.612 & 0.805 & \pi & 0.805 & 0.464 & 0.464 & 0.612 & 0.490 \\ 0.519 & 0.927 & 0.805 & \pi & 0.347 & 0.347 & 0.000 & 0.184 \\ -0.511 & 0.511 & 0.888 & 1.417 & \pi & -\pi & -1.417 & -0.888 \\ 0.511 & -0.511 & -0.888 & -1.417 & -\pi & \pi & 1.417 & 0.888 \\ 0.927 & 0.519 & 0.184 & 0.000 & 0.347 & 0.347 & \pi & 0.805 \\ 0.805 & 0.612 & 0.490 & 0.612 & 0.464 & 0.464 & 0.805 & \pi \end{bmatrix}$$

5(+) 6(-)

$$[T] = \begin{bmatrix} -\pi & 0.000 & 0.588 & 0.519 & -0.321 & 0.321 & 0.927 & 1.107 \\ 0.000 & -\pi & 1.107 & 0.927 & 0.321 & -0.321 & 0.519 & 0.588 \\ 0.219 & 1.107 & -\pi & 1.107 & 0.464 & -0.464 & 0.219 & 0.490 \\ 0.519 & 0.927 & 1.107 & -\pi & 0.785 & -0.785 & 0.000 & 0.588 \\ 0.927 & 0.927 & 0.888 & 1.321 & -\pi & -\pi & 1.326 & 0.888 \\ 0.927 & 0.927 & 0.888 & 1.321 & -\pi & -\pi & 1.326 & 0.888 \\ 0.927 & 0.519 & 0.588 & 0.000 & -0.785 & 0.785 & -\pi & 1.107 \\ 1.107 & 0.219 & 0.490 & 0.219 & -0.464 & 0.464 & 1.107 & -\pi \end{bmatrix}$$

5(+) 6(-)

$$[M] = \begin{bmatrix} 4.000 & -1.333 & -0.205 & -0.061 & 0.600 & -0.600 & -0.800 & -1.600 \\ -1.333 & 4.000 & -1.600 & -0.800 & -0.600 & 0.600 & -0.061 & -0.205 \\ -0.282 & -1.600 & 4.000 & -1.600 & -0.400 & 0.400 & -0.282 & -0.236 \\ -0.061 & -0.800 & -1.600 & 4.000 & -1.000 & 1.000 & -1.333 & -0.205 \\ 0.853 & -0.853 & -0.715 & -3.765 & 8.000 & -8.000 & 3.765 & 0.715 \\ -0.853 & 0.853 & 0.715 & 3.765 & -8.000 & 8.000 & 3.765 & -0.715 \\ -0.800 & -0.062 & -0.205 & -1.333 & 1.000 & -1.000 & 4.000 & -1.600 \\ -1.600 & -0.282 & -0.235 & -0.282 & 0.400 & -0.400 & -1.600 & 4.000 \end{bmatrix}$$

5(+) 6(+) dependency

5(+) 6(+)

5(+) 6(-)

5(+) 6(-)

Nonuniqueness

How to get an additional constraint

$$f(x) = (x - a)^2 Q(x) + px + q$$

$$f(a) = pa + q, \quad \text{when } x = a$$

The number of constraint equation is not enough to determine coefficients of p and q .

Another constraint equation is obtained by differential operator

$$f'(x) = 2(x - a)Q(x) + (x - a)^2 Q'(x) + p$$

$$f'(a) = p, \quad \text{when } x = a$$

Definitions of R.P.V., C.P.V. and H.P.V. using bump approach

- **R.P.V. (Riemann principal value)**

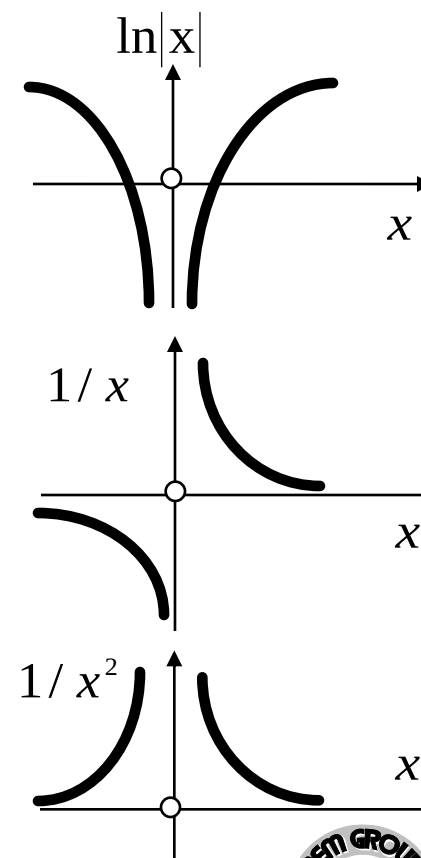
$$R.P.V. \int_{-1}^1 \ln|x| dx = (x \ln|x| - x) \Big|_{x=-1}^{x=1} = -2$$

- **C.P.V.(Cauchy principal value)**

$$C.P.V. \int_{-1}^1 \frac{1}{x} dx = \lim_{\varepsilon \rightarrow 0} \int_{-1}^{-\varepsilon} \frac{1}{x} dx + \int_{\varepsilon}^1 \frac{1}{x} dx = 0$$

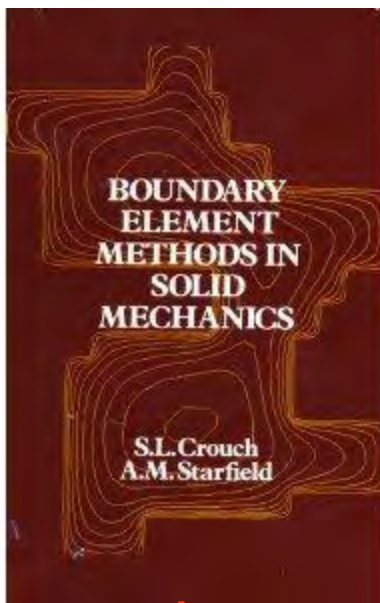
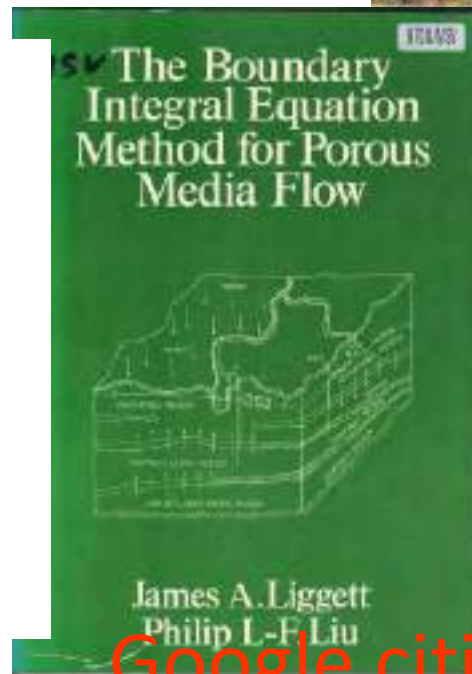
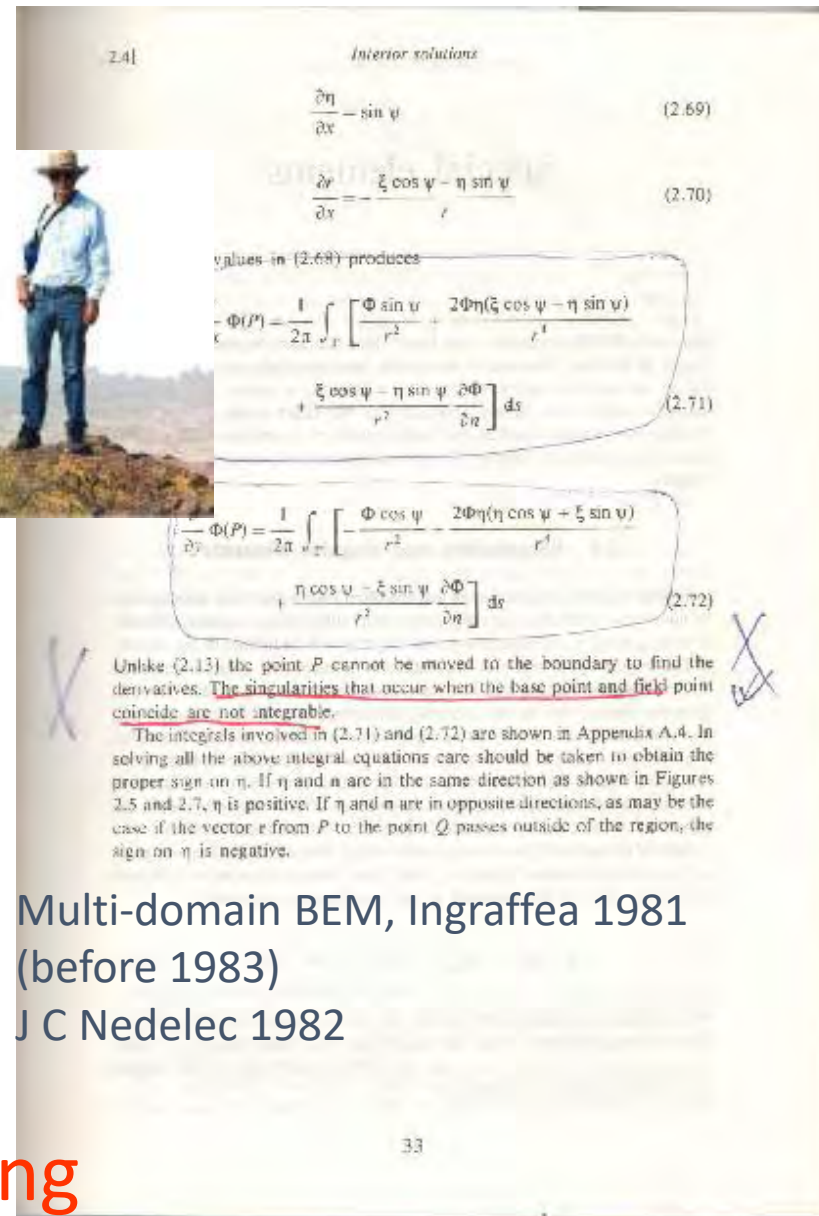
- **H.P.V.(Hadamard principal value)**

$$H.P.V. \int_{-1}^1 \frac{1}{x^2} dx = \lim_{\varepsilon \rightarrow 0} \int_{-1}^{-\varepsilon} \frac{1}{x^2} dx + \int_{\varepsilon}^1 \frac{1}{x^2} dx - \frac{2}{\varepsilon} = -2$$



Liggett and Liu (1983)

- The singularities that occur when the base point and field point coincide are not integrable ???



Multi-domain BEM, Ingraffea 1981
(before 1983)

J C Nedelec 1982

Google citing
1728

15:39 March 20, 2013

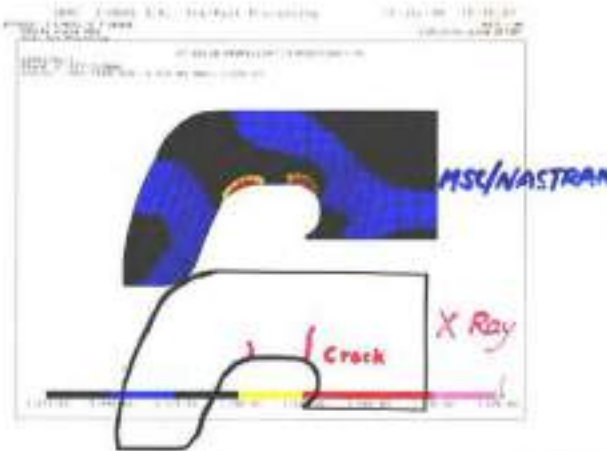
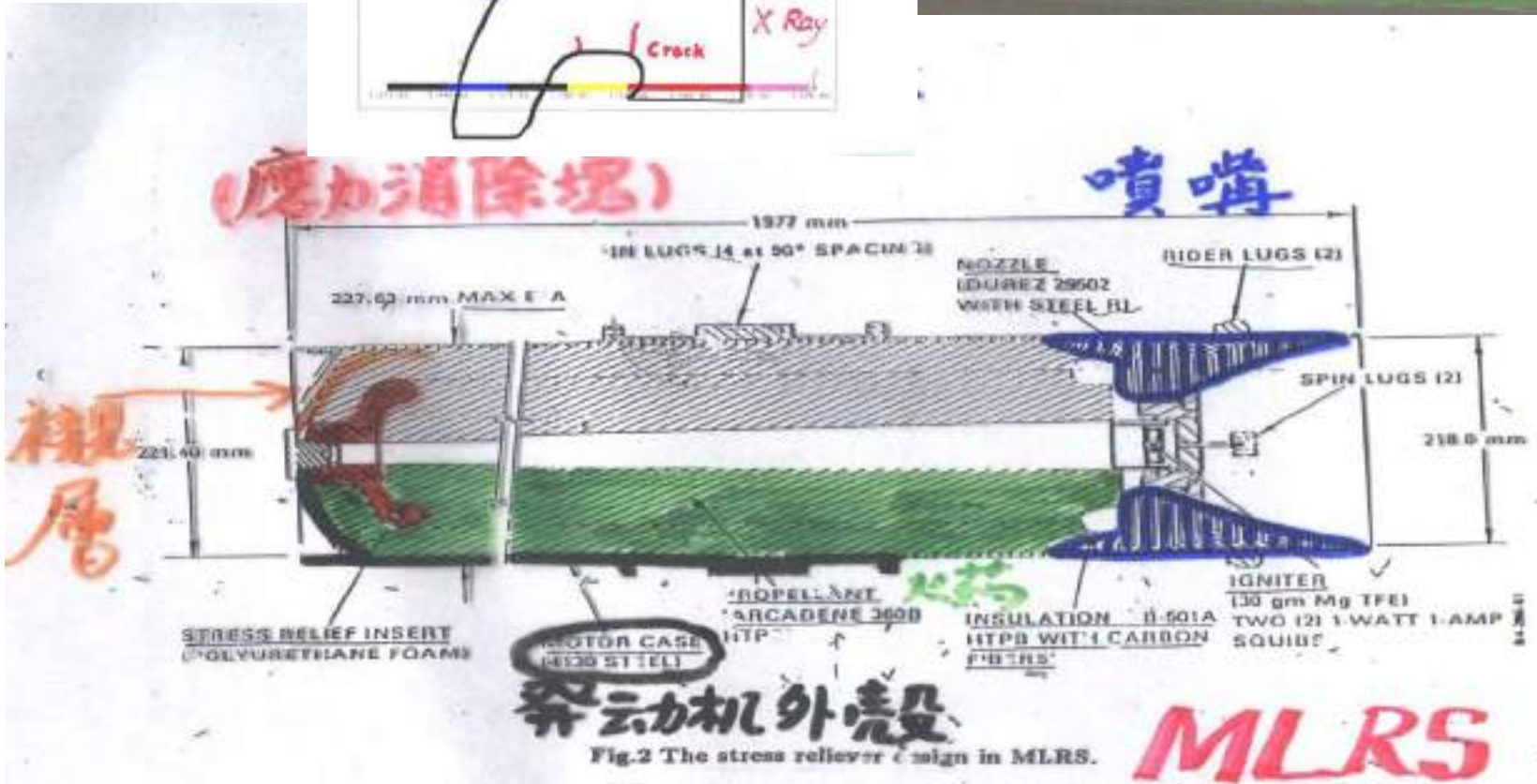
Google citing
574

BEM 4-Taiwan, 2013

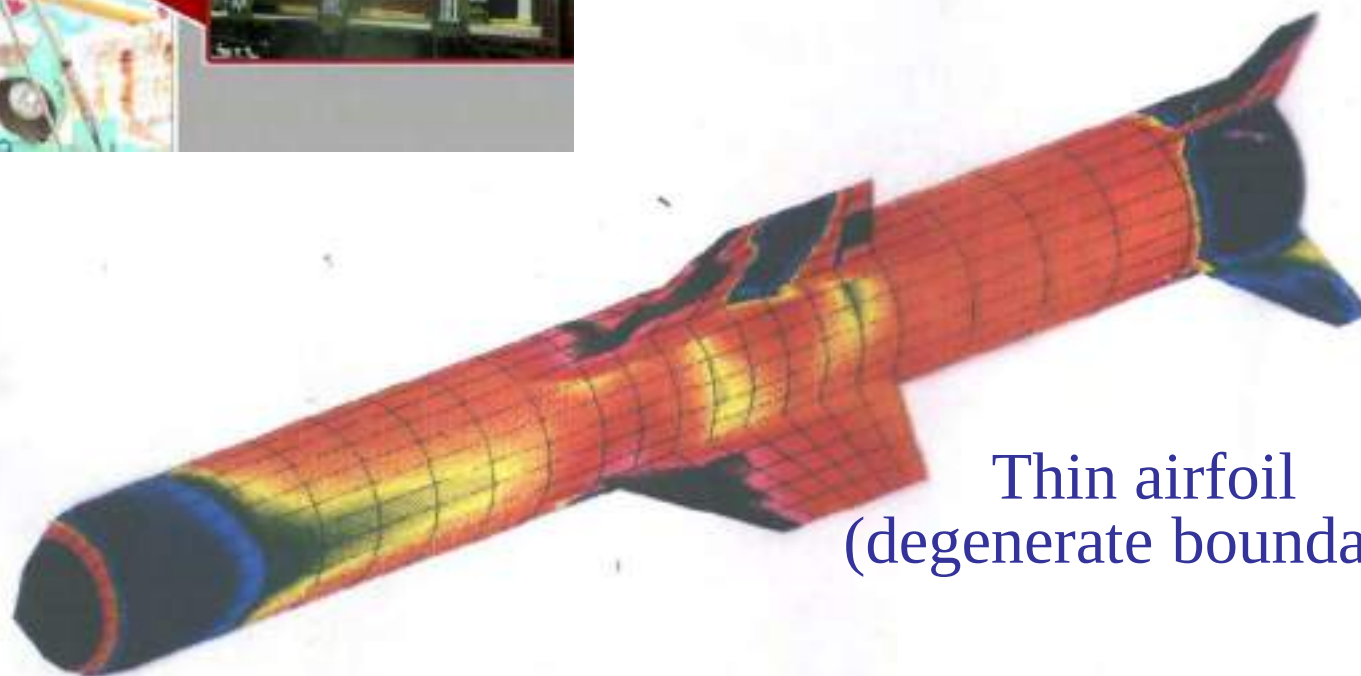


陸海空水下應用(NTOU/MSV)

Solid rocket motor (Army工蜂火箭)



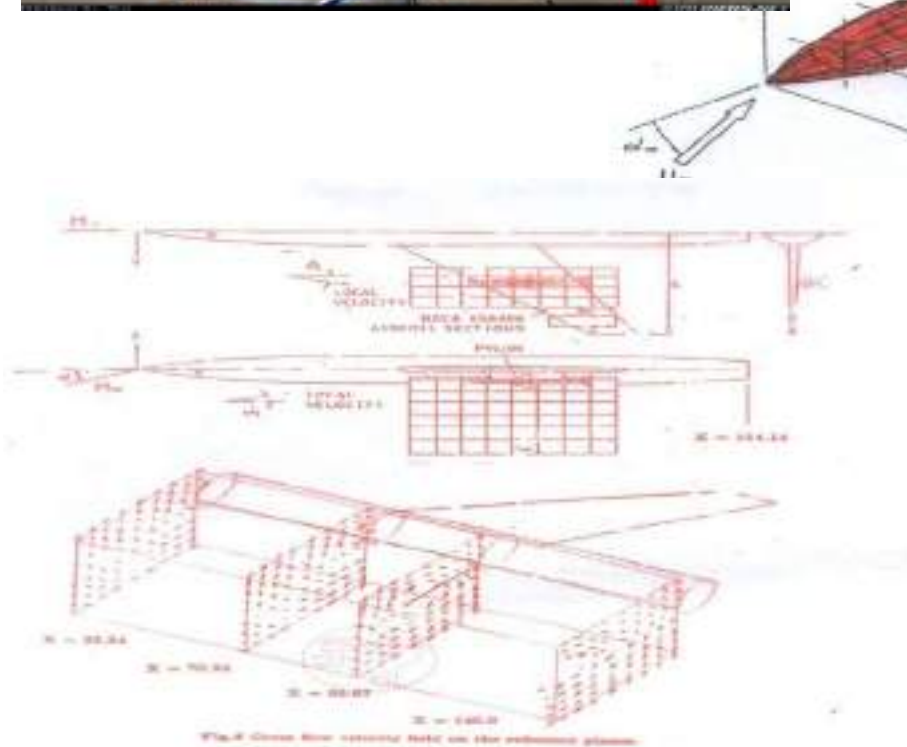
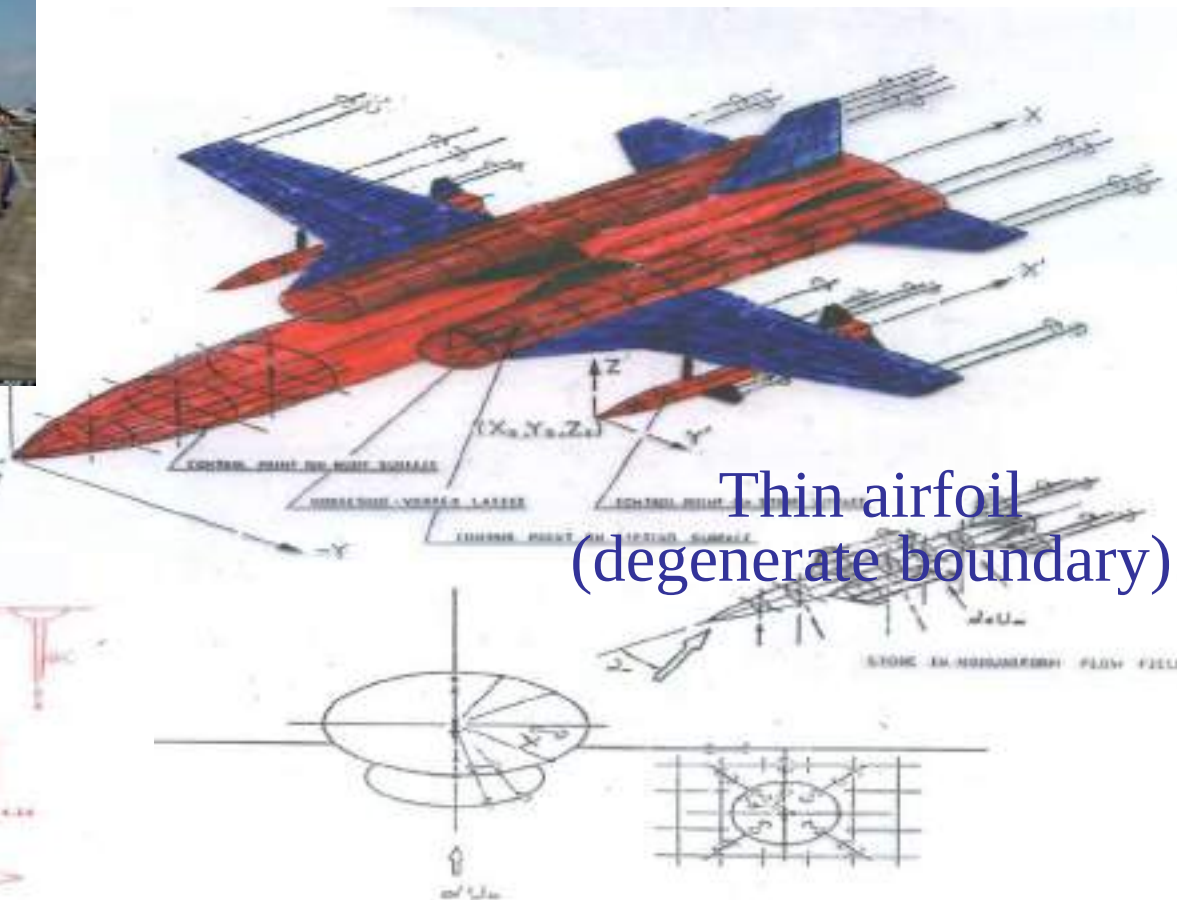
Shong-Fon II missile (Navy)



Thin airfoil
(degenerate boundary)



IDF (Air Force)



Thin airfoil
(degenerate boundary)

Fig.1 Image system of all the singularities in aircraft/external store configurations.

V-band structure (Tien-Gen missile)



Application to V-band structure:
 $\mu = 2850 \text{ kg/mm}^2, \nu = 0.27,$
 $\mu = 0.125, \nu = 3.05 \text{ rad/mm}^2$
 Poisson's law: $\frac{\partial u}{\partial r} = C(AK)^2$
 $C = 4.524 \times 10^{-2}, \mu = 0.5, \nu = \frac{1}{2}$

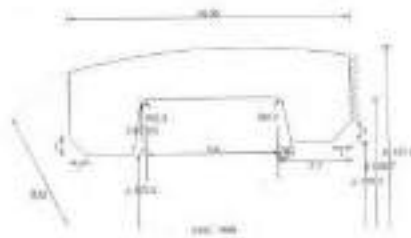
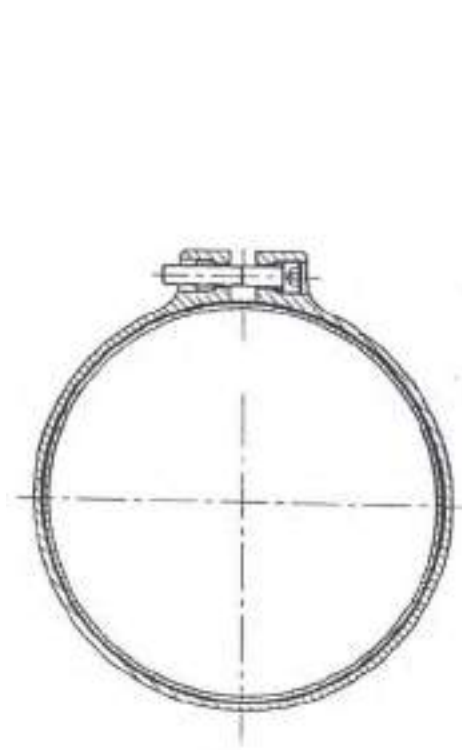


圖 1 · V 型環的結構示意圖

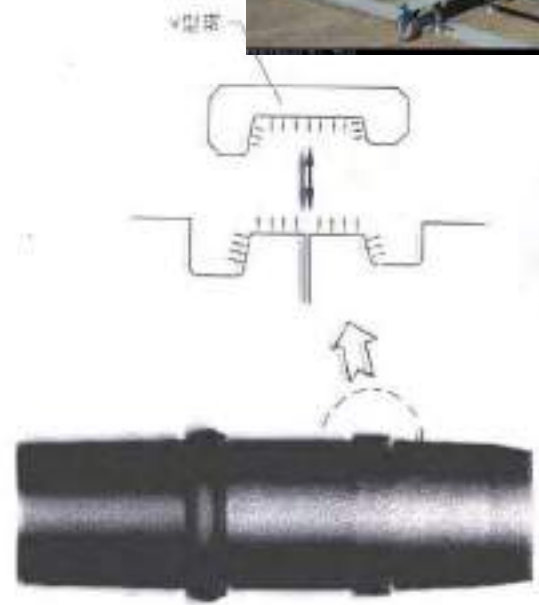


圖 2 · V 型環的結合功能



V 帶有限元分析模型圖

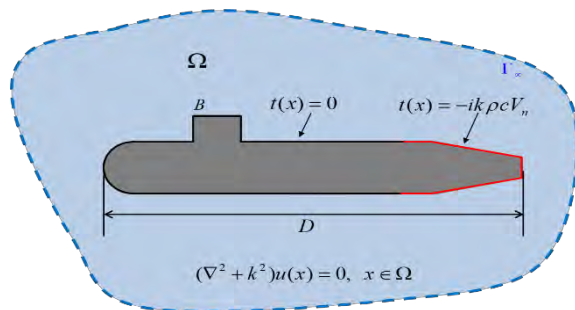
V 帶結構示意圖

Submarine 國艦國造(NIU 陳桂鴻 劉乙睽 NTOU 陳正宗

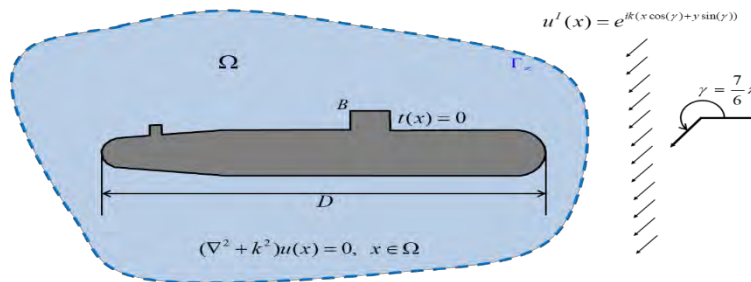
JSV 617 (2025) 119243

Galerkin B.
(H. Bériot et al. 2010)

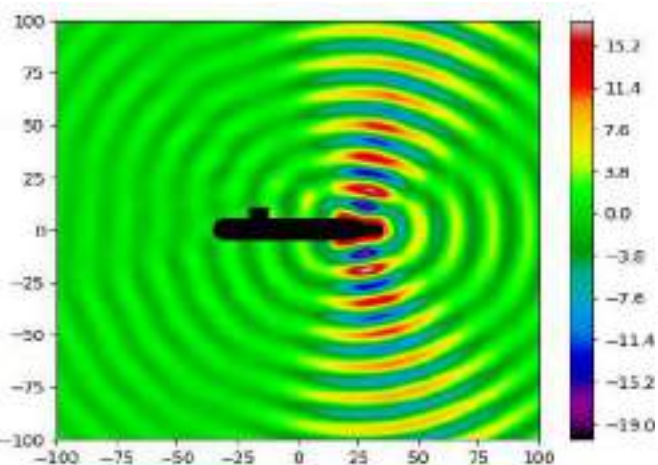
Radiation



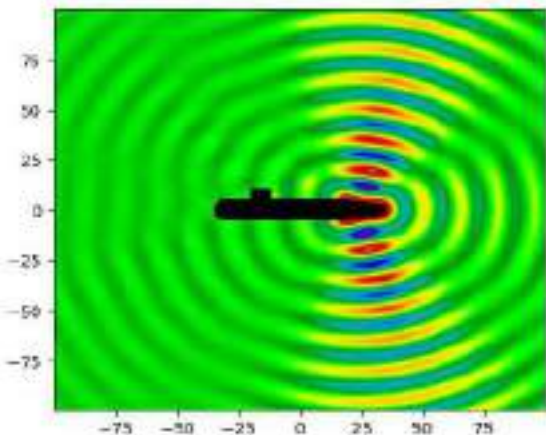
Scattering



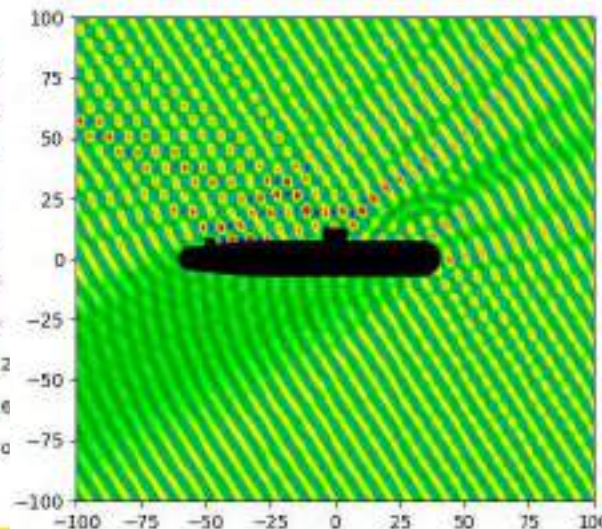
BEM(108)



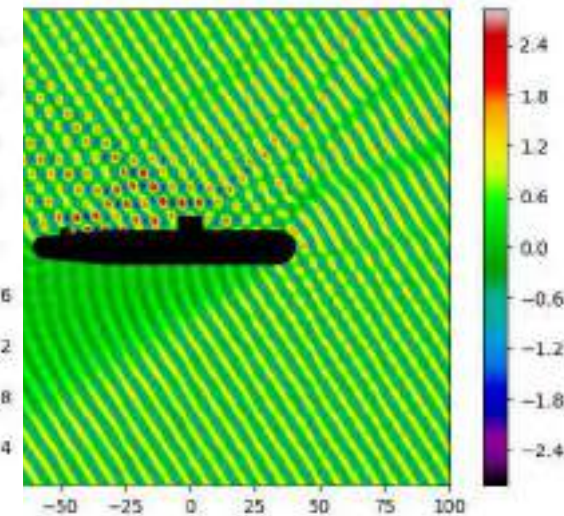
FEM(1,024,000)



BEM(305)

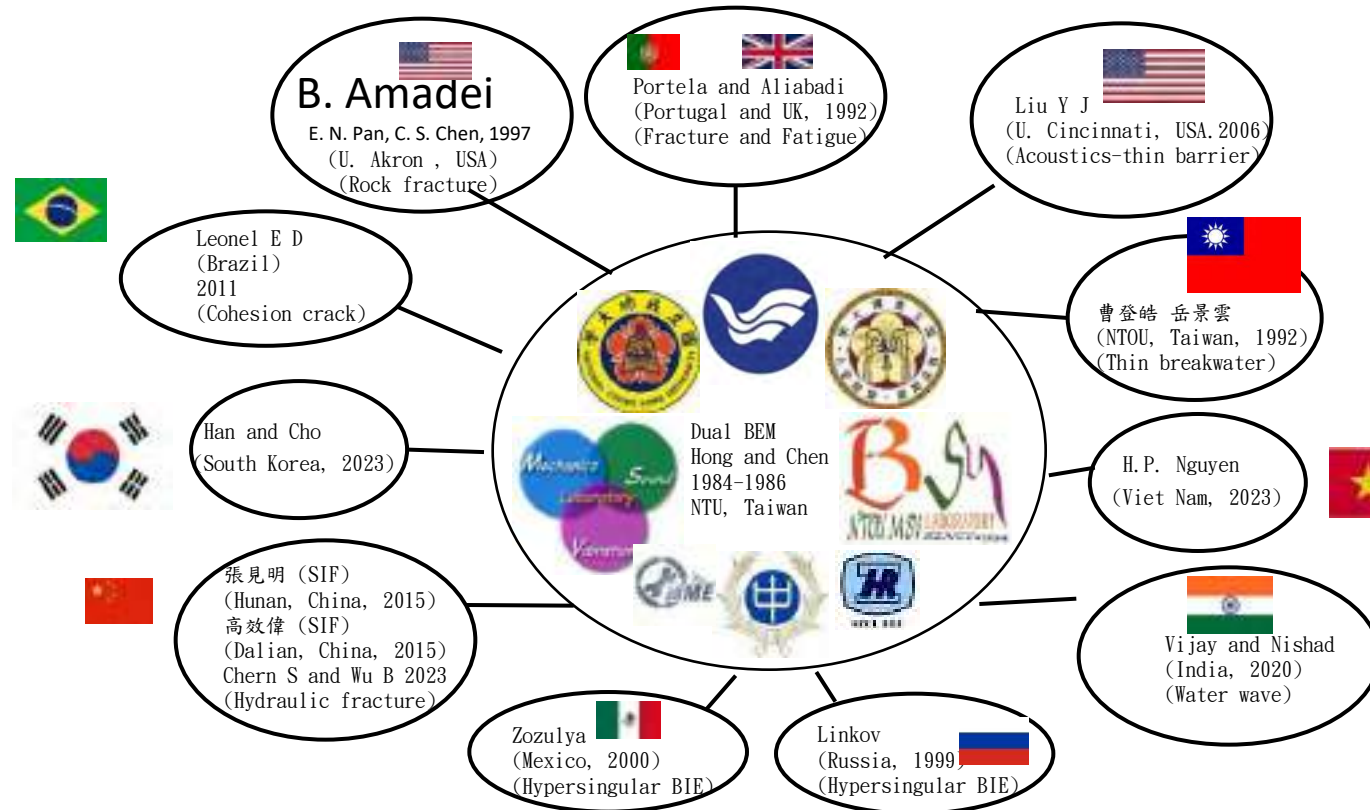


FEM(1.103.872)





Dual BEM (made in Taiwan)



德不孤

必有鄰



Citing records of dual BEM (updated June 4, 2025)

Hong and Chen, 1988
ASCE-EM



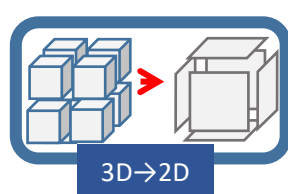
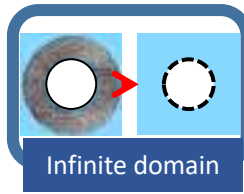
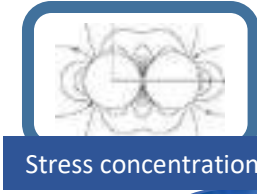
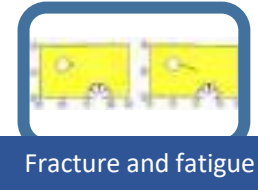
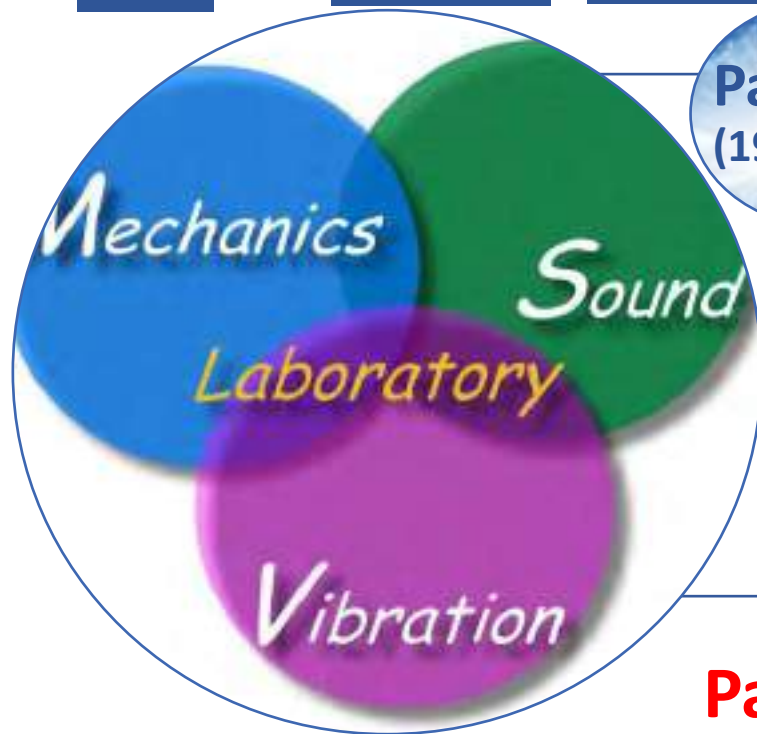
Google: 482

Chen and Hong, 1999
ASME-AMR



Google: 519

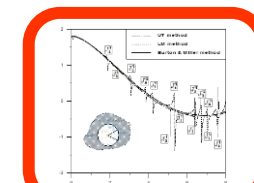
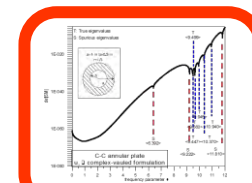
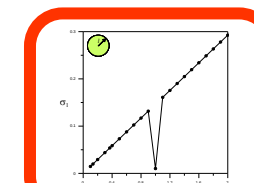
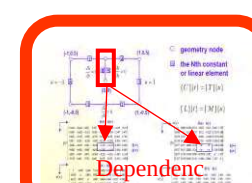
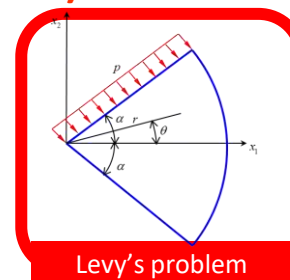
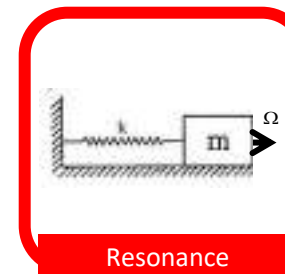
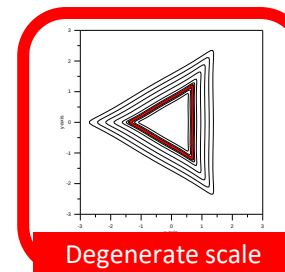
3 Para~ over 30 years



Paradise
(1988-1998)

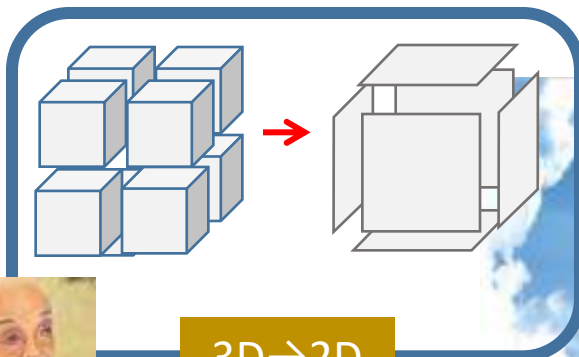
Parasite
(1998-2008)

Paradox
(2008-2018)



(From T.C.T. Ting)

Paradise of BEM (1984-2000)



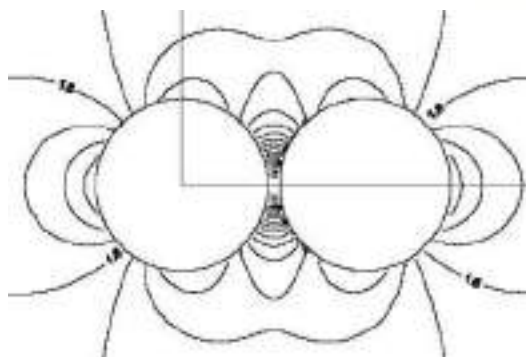
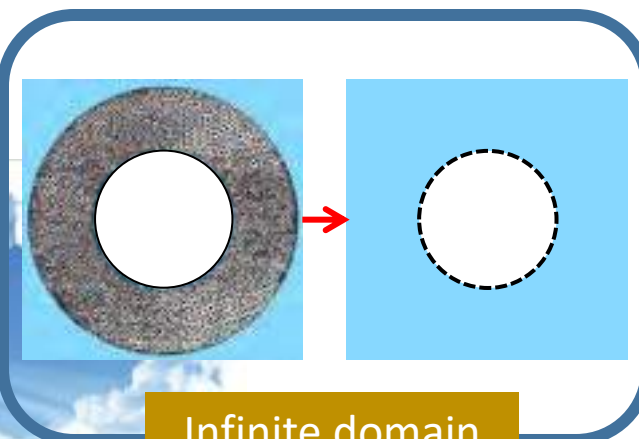
3D→2D



鄭板橋

刪繁就簡 三秋樹
領異標新 二月花

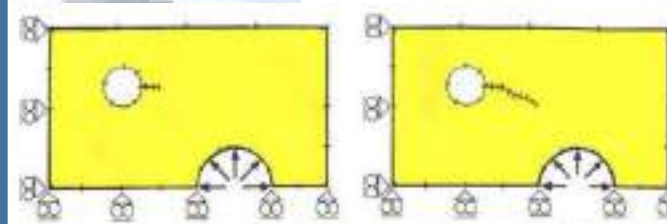
Stress concentration



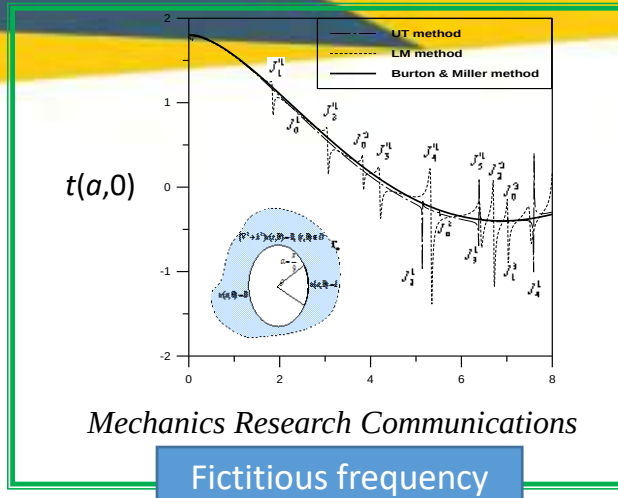
Infinite domain

Paradise

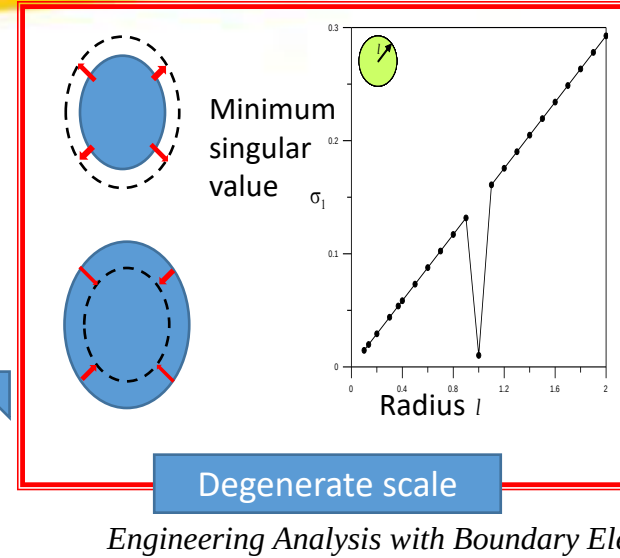
Fracture and fatigue



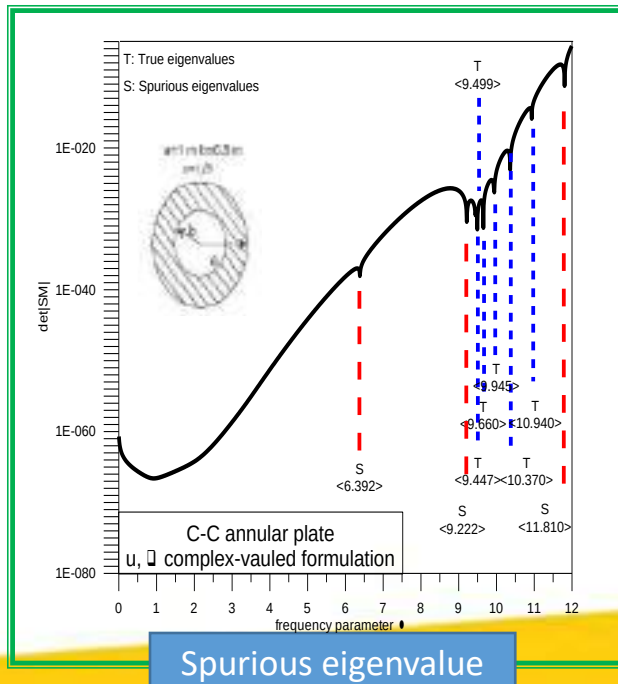
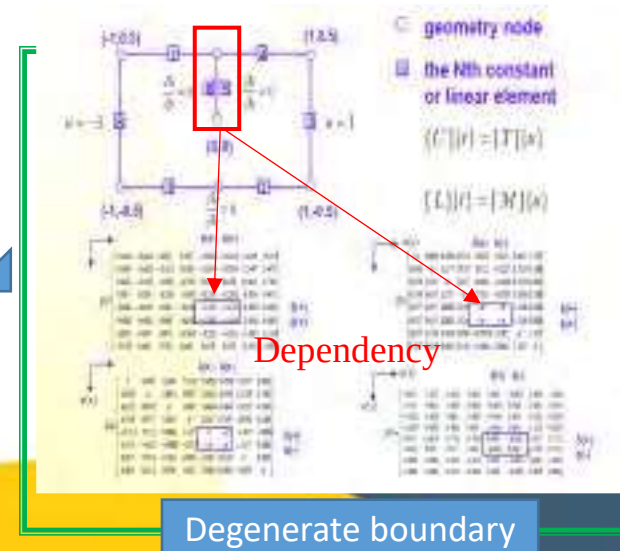
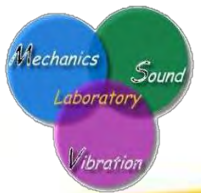
Parasite of BEM (2000-2022)



Rank-deficient systems
0/0



Pitfall
Parasite



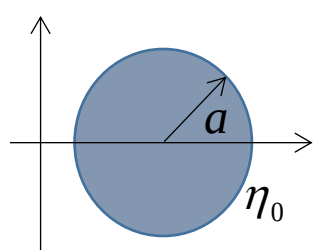
Paradox (NTOU/MSV)



量子物理開山祖師 Niels Bohr 波耳 的話：

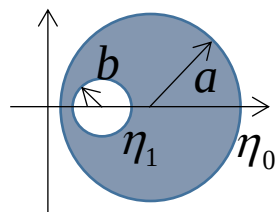
How wonderful that we have met with a paradox.

Now we have some hope of making progress!



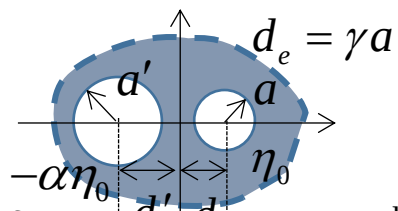
$$a_d = 1$$

$$\ln(2c) - \eta_0 + \sum_{n=1}^{\infty} \frac{1}{n} e^{-2n\eta_0} = 0$$



$$a = a_d = 1$$

$$\ln(2c) - \eta_0 + \sum_{n=1}^{\infty} \frac{1}{n} e^{-2n\eta_0} = 0$$

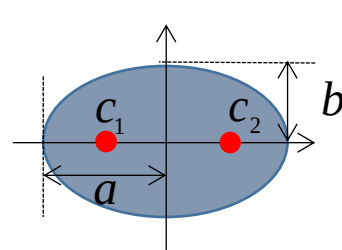


$$a = \frac{c}{\sinh \eta_0}$$

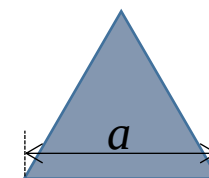
$$d_e = c \frac{\cosh \eta_0}{\sinh \eta_0}$$

$$d_e = c \frac{\cosh \alpha \eta_0}{\sinh \alpha \eta_0}$$

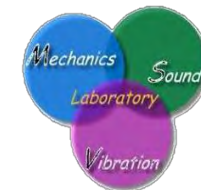
$$\left(2 \ln(2c) - \frac{2\alpha}{\alpha+1} \eta_1 \right) + \sum_{n=1}^{\infty} \frac{2}{n} \frac{(1-e^{-2n\eta_1})}{(e^{2\alpha n \eta_1} - e^{-2n\eta_1})} + \sum_{n=1}^{\infty} \frac{2}{n} \frac{(1-e^{-2n\eta_1})}{(e^{2\alpha n \eta_1} - e^{-2\alpha n \eta_1})} = 0$$



$$a + b = a_d + b_d = 2$$



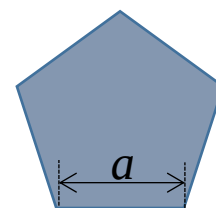
$$N = 3$$



$$\frac{\Gamma(1/3)^3}{4\pi^2} h = 1$$

$$a = a_d \square 2.37105$$

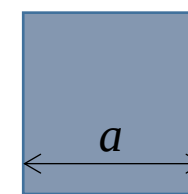
$$N = 5$$



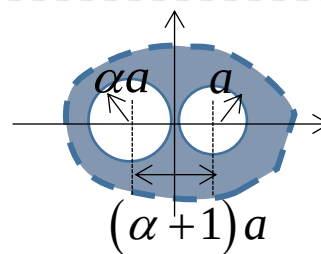
$$a_d = \frac{4\pi \Gamma(2/N)}{\Gamma(1/N)^2}$$

$$a = a_d = \frac{4\pi \Gamma(2/5)}{\Gamma(1/5)^2} \square 1.32257$$

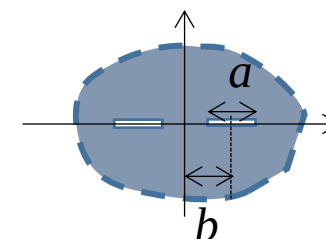
$$N = 4$$



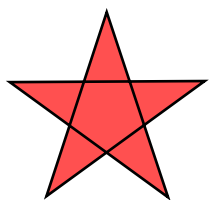
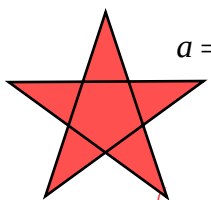
$$a = a_d = \frac{4\pi \Gamma(1/2)}{\Gamma(1/4)^2} \square 1.69443$$



$$a = \frac{\alpha+1}{\alpha\pi} \cos\left(\frac{\pi}{2} \frac{\alpha-1}{\alpha+1}\right)$$

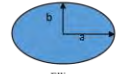
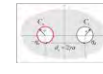
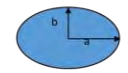
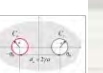
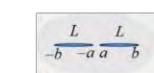
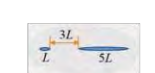
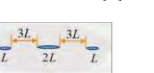
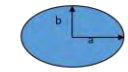
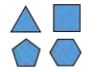
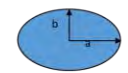
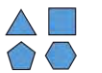
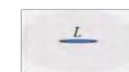
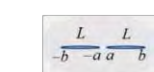
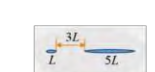
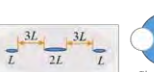


$$a(a+2b) = 4$$



邊界元素法 阿基里斯腱

BEM/BIEM achilles tendon

Method	Geometry shape									
Degenerate kernel	 Circle [14], [31], [8], [19], [3]	 Ellipse [31], [10]	 Concentric circle [14], [8], [9]	 Eccentric circle [19]	 Two equal circle [19], [29]	 Two unequal circles [12]				
Complex variable	 Circle [28]	 Ellipse [10]	 N-polygons [27], [28]	 Two tangent discs [11]	 Semi-disc [17]	 Two equal circle [29]	 Two unequal circles [12]			
	 A line segment [14]	 Two line segments [14]	 Two unequal line segments [14]	 Three line segments [14]	 Three line segments [14]					
Scaling technique	 Circle [16]	 Ellipse [16]	 N-polygons [16]				 Arbitrary shape [17]	 Circular cross section with keyway [6]		
BEM	 Circle [14], [31], [8], [19], [5]	 Ellipse [31], [10]	 N-polygons [16], [31], [27], [18]	 Concentric circle [14], [8], [9], [19]	 Semi-disc [17]	 Two equal circle [29]	 Arbitrary shape [17], [27]	 Eccentric circle [9]		
	 A line segment [14]	 Two line segments [14]	 Two unequal line segments [14]	 Three line segments [14]	 Three line segments [14]	 Circular cross section with keyway [14]				



Failure of BIEM/BEM

for the special case



Analytical derivation (Objectivity)

Ⓓ Degrees

Ⓔ Rad



dimensionless argument

$\ln(?)$

$e^{(?)}$

$\sin(?)$

$H_0(?)$

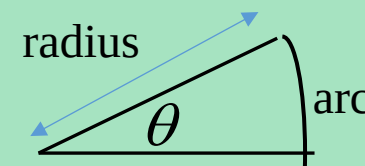
Laplace equation

Lin and Wu (2007), Journal of the
Mathematical Society of the Philippines

林琦焜 吳恭儉

$$\sin(30) = -0.9880316 \neq$$

$$\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$$



$$\theta = \frac{\text{arc}}{\text{rad}}$$

心得分享(黃文生)

本無菩提樹
明鏡亦非台
本來無一物
何處惹塵埃

時時勤拂拭
勿使惹塵埃



1984-2026 研究近四十年

分享蘇東坡心境

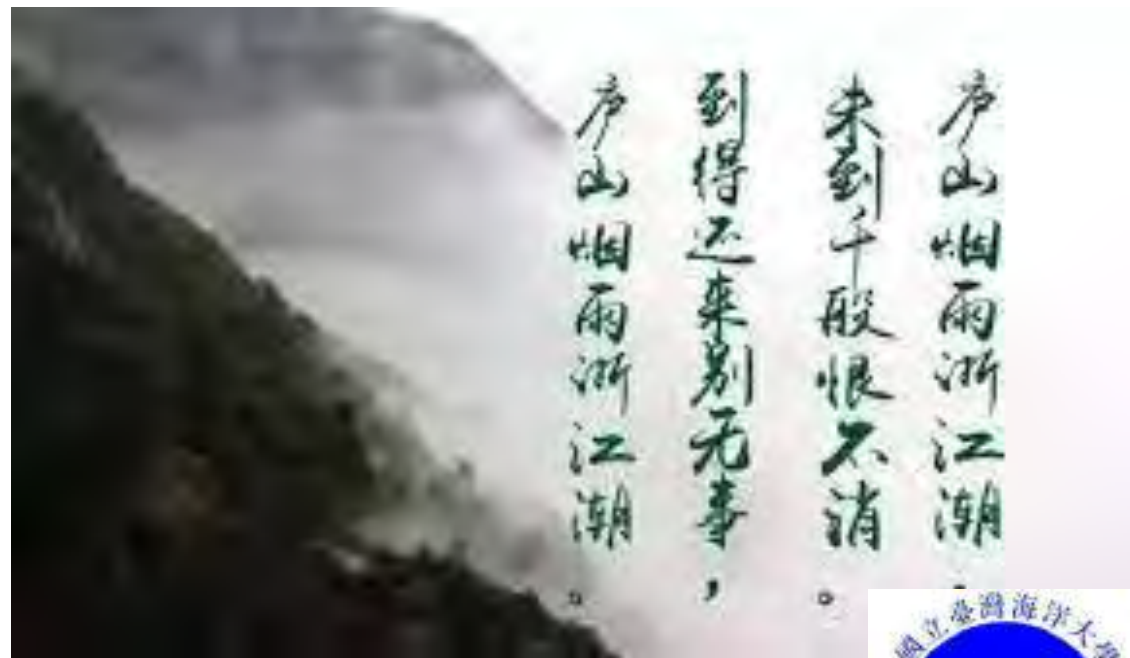


廬山煙雨浙江潮 (Paradise)

未到千般恨不消

到得還來別無事 (Parasite)

廬山煙雨浙江潮
(paradox)





合作(NTOU/MSV)



NTOU/MSV Collaborators since 1988



(德不孤 必有鄰)

PI:陳正宗特聘講座教授

- India C.S. Nishad 、 K.G. Vijay
- Kuwait S.Neelamani
- China 韓厚德、谷岩、傅卓佳、張耀明
- Canada 李子才
- Taiwan

海大:周宗仁、郭世榮、葉為忠、曹登皓、林三賢、岳景雲、劉德源、
張建仁、劉進賢、李應德

台大:葉超雄、陳正興、洪宏基、楊德良、鍾立來、劉立偉

陳義麟、陳桂鴻、李家瑋、陳立言、李為民、呂學育、徐文信、全
湘偉、黃宏財、李明恭



Filename: NTOU/MSV

Cooperators made by品瑄、品臻



NTOU/MSV Collaborators since 1988



India



C.S. Nishad



K.G. Vijay



H. Behera

Kuwait



S. Neelamani

Canada



李子才



韓厚德



谷岩



傅卓佳



張耀明



Filename: NTOU/MSV

Cooperators made by 品瑄、品臻



NTOU/MSV Collaborators since 1988



陳正宗



Taiwan



周宗仁



郭世榮



葉為忠



曹登皓



林三賢



岳景雲



劉德源



張建仁



劉進賢



李應德



陳立言



陳義麟



陳桂鴻



李家瑋



李為民



呂學育



徐文信



葉超雄



陳正興



洪宏基



楊德良



鍾立來



劉立偉



全湘偉



黃宏財



李明恭



Filename: NTOU/MSV
Cooperators made by品瑄、品臻

Taiwan-India joint work on breakwater using the dual BEM (2022-2025)

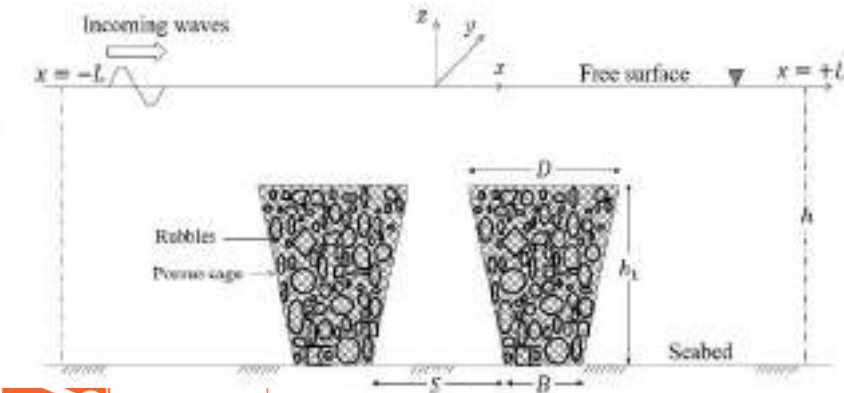
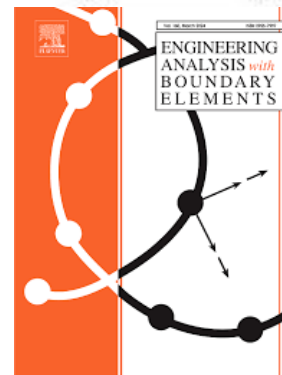
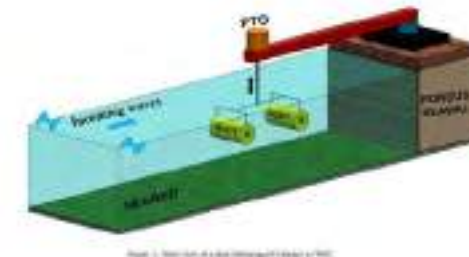


(ZAMM2023)

C.S. Nishad, S. Neelamani, J.T. Chen, and K.G. Vijay, 2023, Gravity Wave Interaction with Cage Enveloped Breakwaters using DBEM, Z Angew Math Mech (ZAMM), e202200064, <https://doi.org/10.1002/zamm.202200064>

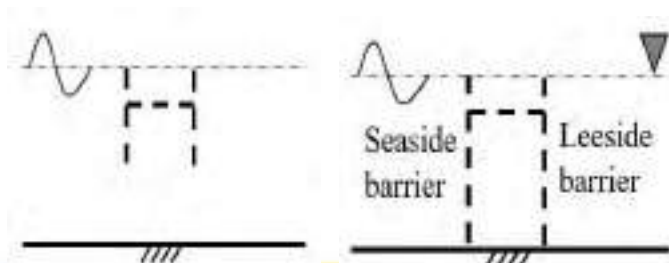
(EABE2023)

K.G. Vijay, C. S. Nishad, S. Neelamani, and J.T. Chen, 2021, Dual BEM for Wave Scattering by a H-Type Porous Barrier with Nonlinear Pressure Drop, Engineering Analysis with Boundary Elements, Vol.131, pp.280-294.



(EABE2024)

1. R. Appandairaj, K.G.Vijay, K.Murali and J.T.Chen, 2024, Oblique Wave Interaction with Dual Submerged Oscillating Buoy as WEC near a Partially Reflecting Wall, Engineering Analysis with Boundary Elements, Vol.166, 105822.



(EABE, POF and Renewable Energy, 2025, Revision))



Taiwan-India joint work on breakwater using the dual BEM (2025)



(POF 2025)

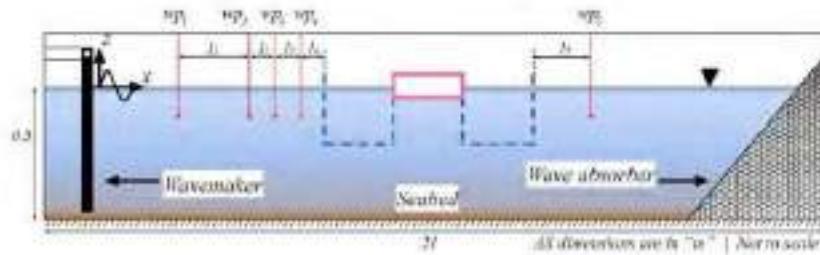


Fig. 4. Schematic representation of experimental setup in the wave flume.



Fig. 5. Wave flume facility in Department of Ocean Engineering, NTU.

S. Salman, K. G. Vijay, H. Bel
scattering by barge integrated porous cages: experimental and
numerical study, Physics of Fluids, **Accepted**

(EABE2025)

S. Salmana, K.G.Vijay, C.S. Nishad and J.T.Chen, 2025, Numerical and
Experimental Investigation on Compartmentalized Porous Cages,
Engineering Analysis with Boundary Elements, 179 106353.



Fig. 1. Physical model of the cages.

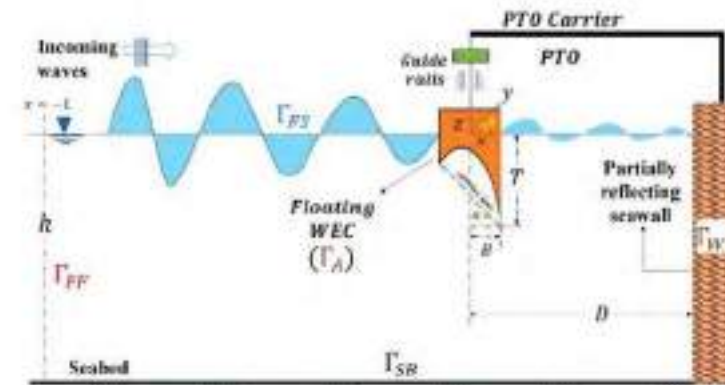
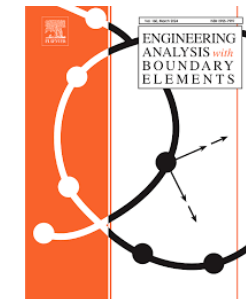
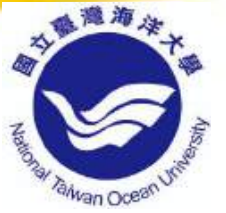


Figure 1: Schematic diagram of a half-arc floating WEC.



1. R. ... T Chen, 2026,
Experimental and Numerical Investigation of an
Asymmetric Half-airfoil bottom Wave Energy Converter
under Regular and Irregular Sea states, Ocean Engineering,
Revised.





Take home parameters

PARADISE

PARASITE PARADOX

Take home poems

蘇軾觀潮 惠能悟禪









唐代禪宗
慧能大師
禪後頓悟

菩提本無樹
明鏡亦非台
本來無一物
何處惹塵埃

NTOUMSV
BEM前

充要 BIE



唐代禪宗
神秀大師
禪前漸修

身是菩提樹
心如明鏡台
時時勤拂拭
勿使惹塵埃

NTOUMSV
BEM後





學思並重

窮理致知



學而不思則罔，
思而不學則殆。



孔子



李顯智

AI不強，無以證斯理之變化，
AI不印證於人，則為俗學。



黃宗義

讀書不多，無以證理之變化
多而不求於心，則為俗學。



有質有亮有多文



人文並重



孔子



友直友諒友多聞



Thanks for your kind attention

感謝 Phi Tau Phi



URL: <http://msvlab.hre.ntou.edu.tw/> Since 1999

U tube: <https://www.youtube.com/watch?v=1d3xr9zdFGg> Since 2015

E mail: jtchen@mail.ntou.edu.tw

Google citing: <http://scholar.google.com/citations?user=CcL1xQoAAAAJ&hl=en>





一招半式闖蕩江湖II



李小龍曾說，「我決不會說我是天下第一，可是我也決不會承認我是第二。」

據他的妻子琳達在李小龍傳記《我眼中的布魯斯李》中回憶，其實有一種對手，李小龍也會害怕。

有一次，琳達問李小龍：是不是天下第一，就沒有害怕的對手？李小龍搖著頭說：「我不是天下第一，其實我很怕一種對手。」

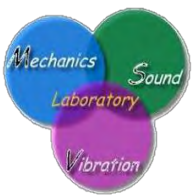
琳達很驚訝，問道：「你怕什麼樣的對手？」

李小龍說：「我不怕會一萬種招式的人，我怕把一種招式練一萬遍的對手。」

<https://www.ntdtv.com/b5/2018/10/02/a1393731.html>

職人精神

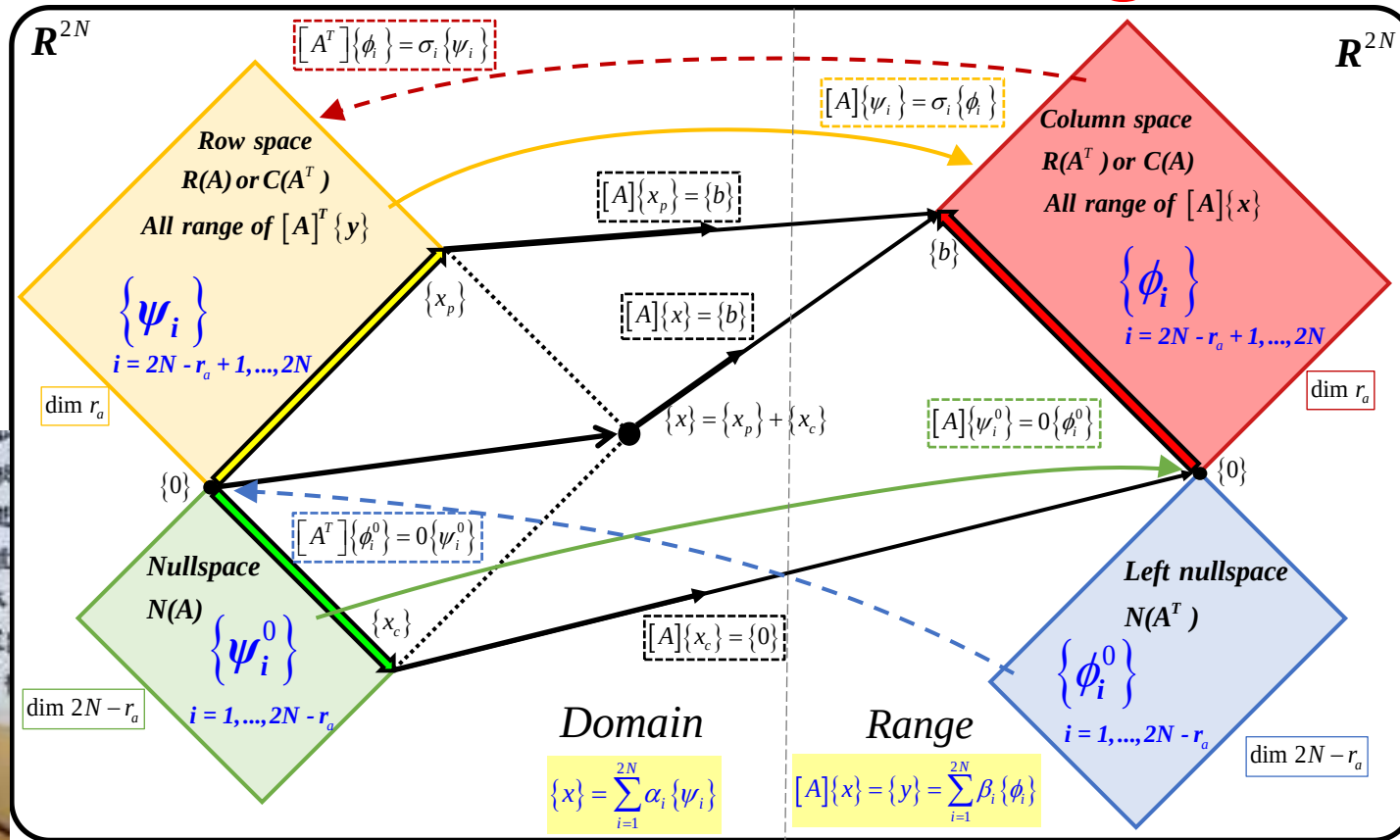
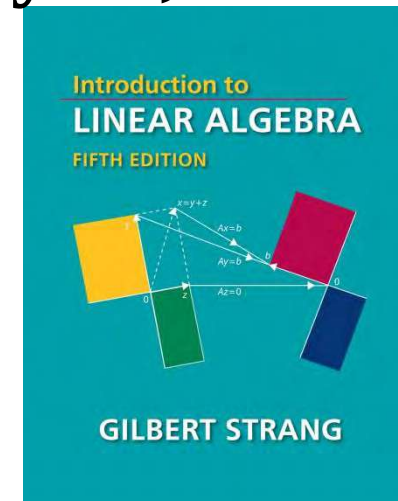




Null space of influence matrices in the BEM

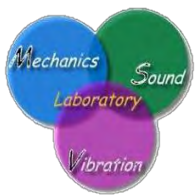


Stupid **Chen** paid more than 40 years (from 1981 to 2023) to understand one book cover of **Master Strang** book May 15, 2023



Paradise, parasite and paradox in the dual BEM (U, T, L and M matrices)





Message from Gilbert Strang

May 15, 2023 last lecture



Dear NTOU/MSV people,

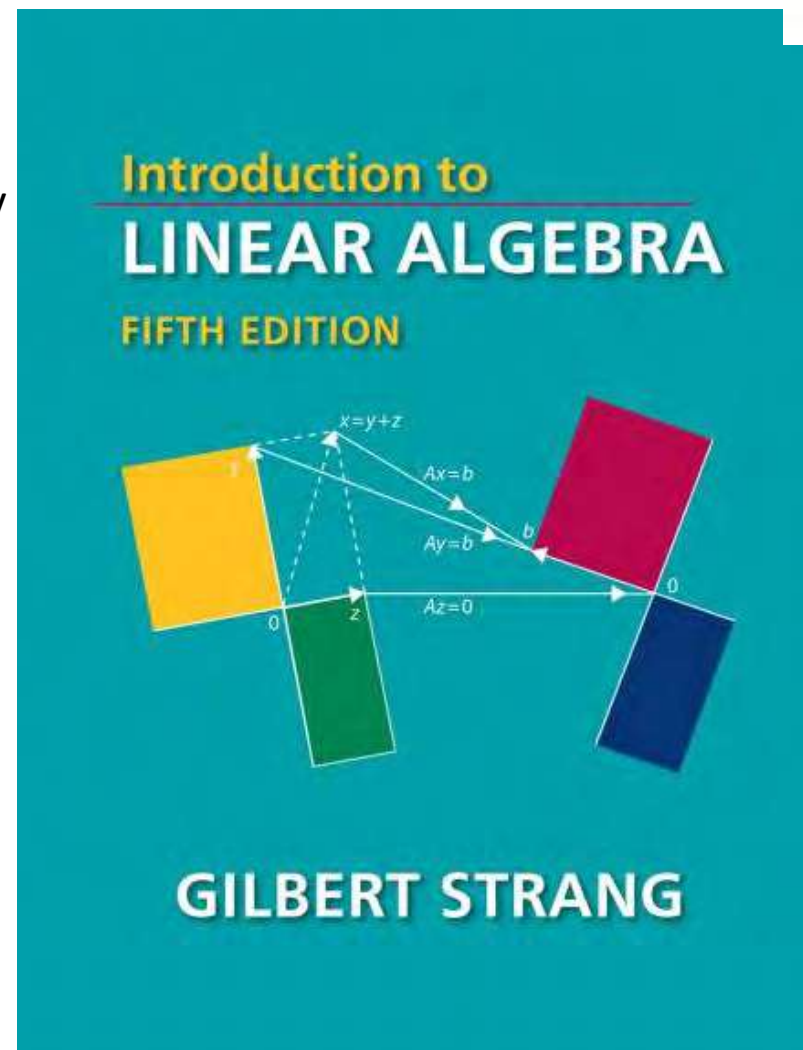
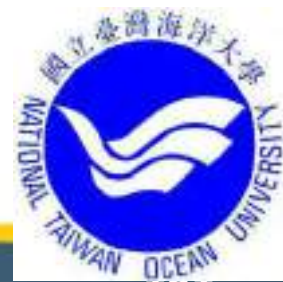
Thank you for such a generous message ! I am very happy that you approve of the final lecture -- I wasn't sure what to say . I am so fortunate to have the chance to teach at MIT and also to have the lectures for Math 18.06 and 18.065 on Opencourseware ocw.mit.edu . It is neat that you found applications for the 4 subspaces figure.

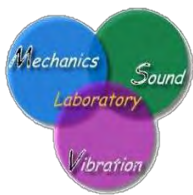
Linear algebra is a beautiful subject --- and teaching is a beautiful life.

I hope all your work and your life goes well !

Very best wishes

Gilbert Strang May 17, 2023

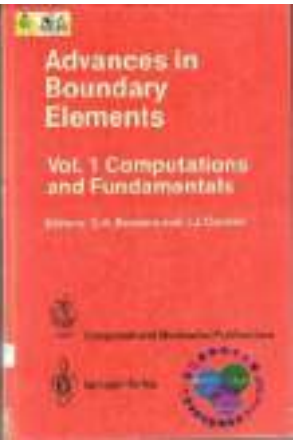




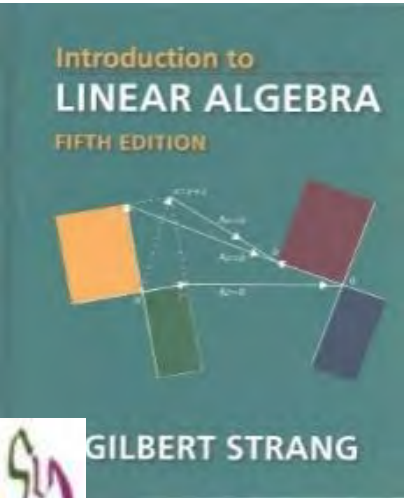
NTOU/MSV 與 MIT 大師 結緣



1989 BEM 11 J J Connor



1995 S H Crandall



Gilbert Strang May 15, 2023 last lecture

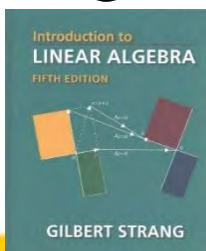


Mapping diagram of Strang

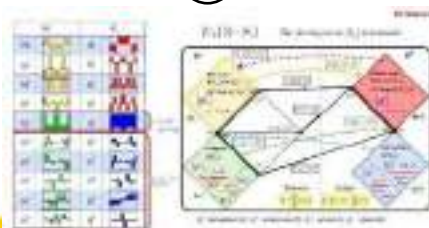


No.	Year	Author	Book or paper	Title	Status
1	2016	Gilbert Strang	Book	Introduction to Linear Algebra (5 th edition)	Appear
2	2021	YL Huang	TAFM	Study on the stress intensity factor and the double-degeneracy mechanism in the BEM/BIEM for anti-plane shear problems (double degeneracy)	Appear
3	2021	WC Tai	CPAA	An indirect BIE free of degenerate scales (degenerate scale)	Appear
4	2021	CH Shao	EABE	On the role of singular and hypersingular BIEs for the BVPs containing a degenerate boundary (degenerate boundary)	Appear
5	2022	JH Kao	JE	Study on the double-degeneracy mechanism of BEM/BIEM for a plane elasticity problem with the line segments (double degeneracy)	Appear
6	2023	JH Kao	EABE	Are the direct and indirect BEM/BIEMs equivalent ?	Appear

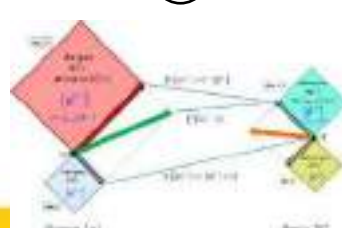
①



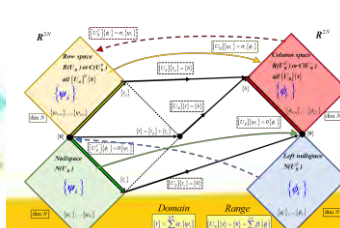
②



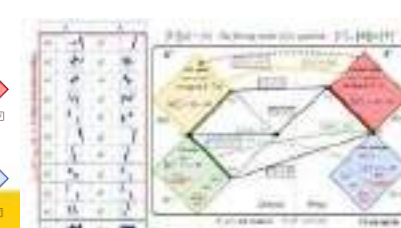
③



④



⑤



⑥



太極

Real variable

ASCE, 1988
(324 citings)



ASME, 1999
(398 citings)



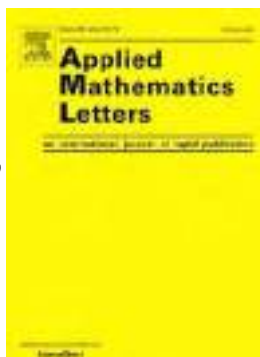
兩儀

Complex variable

2000



2013



2015



四相

Quaternion

2018



NTOU/MSV

J. T. Chen



NTU/MSV

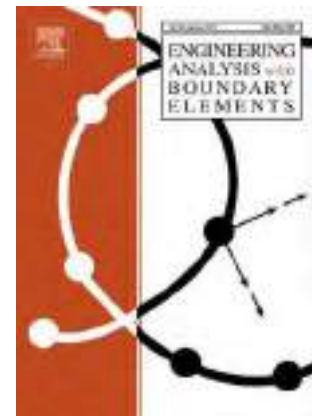
H.-K.Hong



八卦

Clifford

2016



NCKU/MSV

L.W. Liu



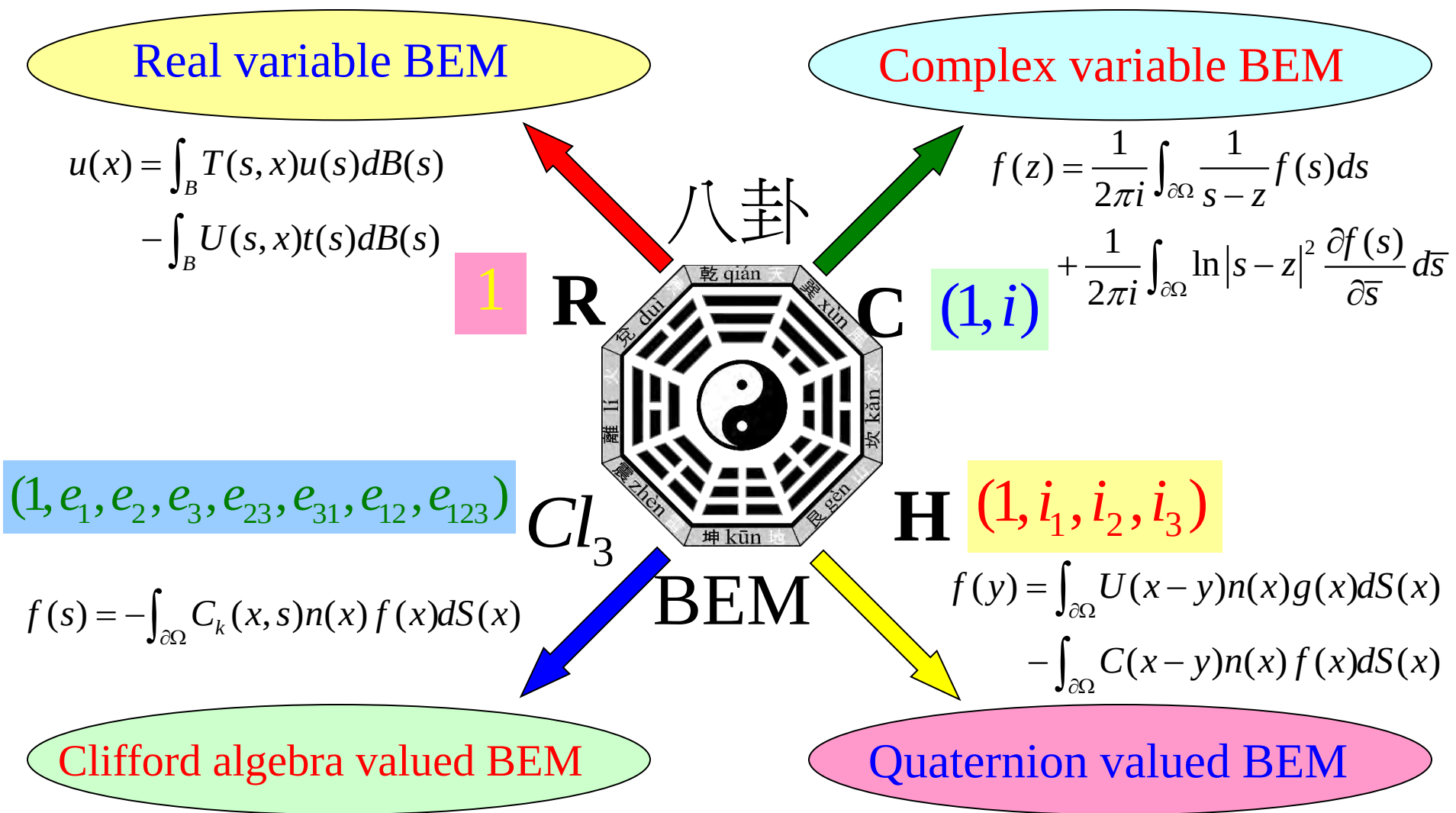
TKU/MSV

J.W. Lee



八卦邊界元

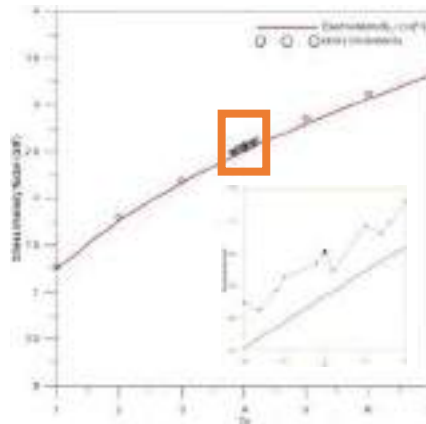
Bagua boundary element method





Numerical instability of BEM/BIEM

Statics (rigid line inclusion)
2D Laplace equation

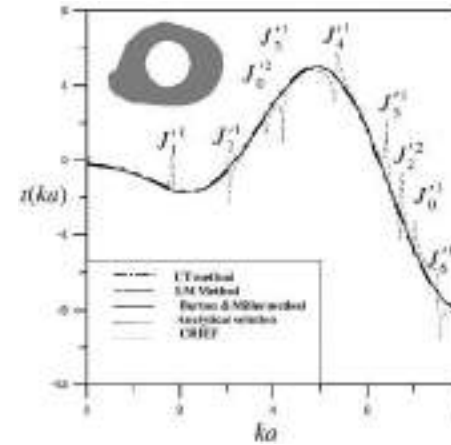


Degenerate scale

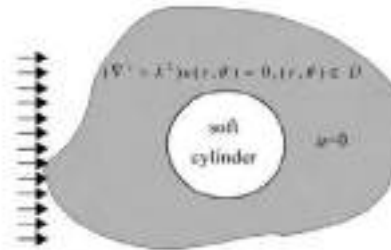


Stress intensity factor

Dynamics (time-harmonic)
Helmholtz equation

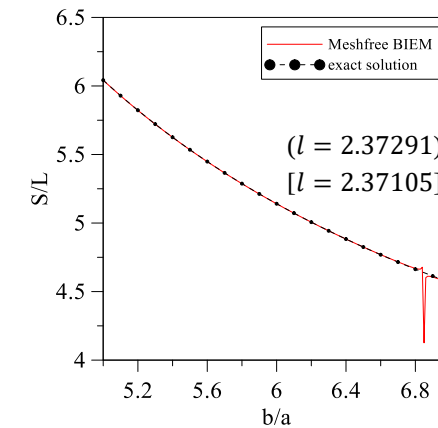


Fictitious frequency

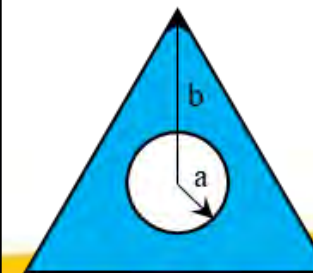


radiation and scattering

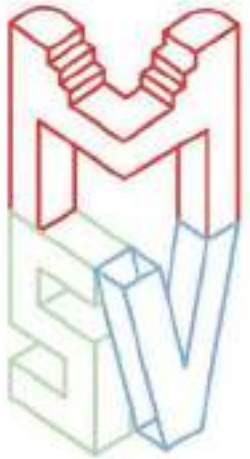
Statics (heat conduction)
2D Laplace equation



Degenerate scale

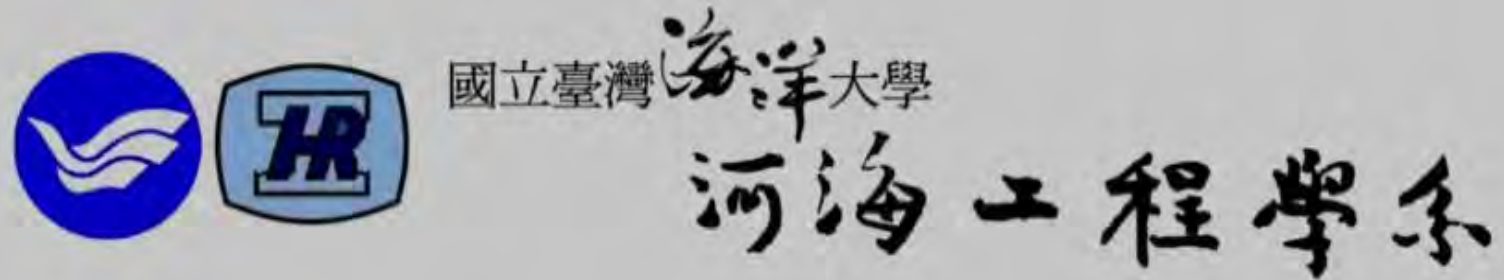


Exchanger tube
conduction shape factor



【海大河工系實驗室介紹】

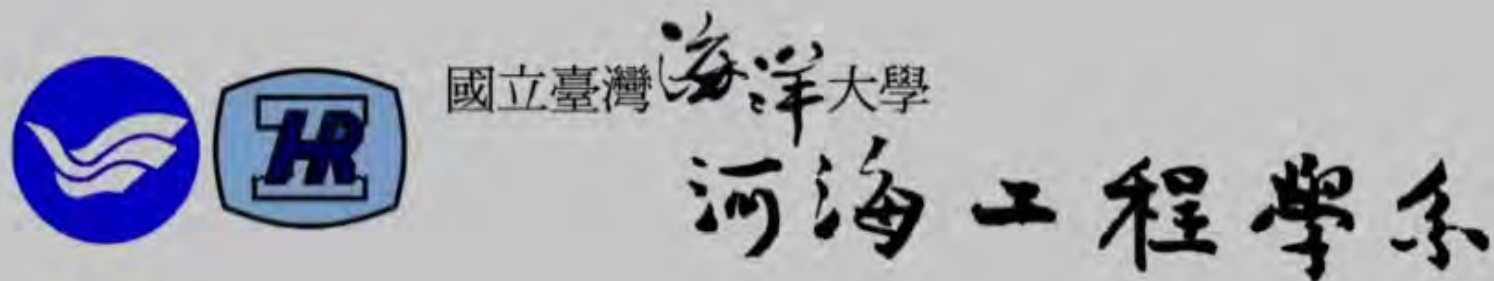
NTOU MSV研究團隊



NTOU/MSV
研究團隊

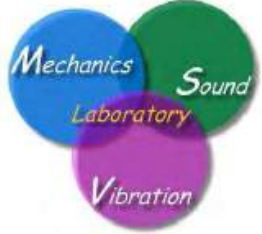
國立臺灣海洋大學 河海工程學系

【海大河工系教師與研究室介紹】 力學聲響振動實驗室 MSVLAB



力學聲響振動實驗室

國立臺灣海洋大學 河海工程學系

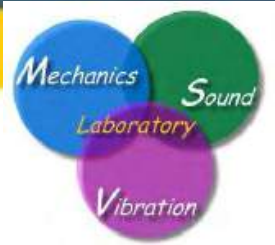


邊界元 來結緣 Line group 學術俱樂部

(我們不是邊緣人)



NTOU/MSV 30 年成績單 since 1994



陳正宗特聘講座教授自1994年起
建立NTOU/MSV團隊，

4個博士生

52位碩士生

44 位大學生 totally 100 persons

出國紀錄 77 Publish 87 sci journals

256 SCI papers

Failure 3 master students

劉天賜、方銓尉、張嘉焜

Failure of 2 years graduation 江立傑 楊政霖

Success of all graduated master students

At least one sci paper for each one



Thanks for your kind attention

感謝 洪盟凱教授與鄒駿翔教授 邀請



URL: <http://msvlab.hre.ntou.edu.tw/> Since 1999

U tube: <https://www.youtube.com/watch?v=1d3xr9zdFGg> Since 2015

E mail: jtchen@mail.ntou.edu.tw

Google citing: <http://scholar.google.com/citations?user=CcL1xQoAAAAJ&hl=en>



國立臺灣海洋大學

National Taiwan Ocean University

Dual BEM, DDM and Dislocation theory

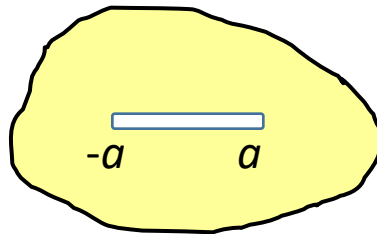


Dual BEM

Hong and Chen (ASCE, 1988)

$$c_{ij}u_j(x) = \int_B U_{ki}(s, x)t_k(s)dB(s) - C.P.V. \int_B T_{ki}(s, x)u_k(s)dB(s)$$

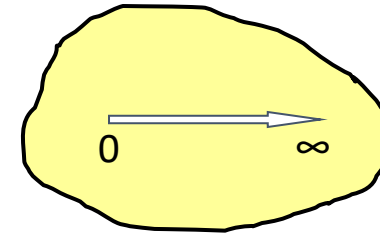
$$c_{ij}t_j(x) = C.P.V. \int_B L_{ki}(s, x)t_k(s)dB(s) - H.P.V. \int_B M_{ki}(s, x)u_k(s)dB(s)$$



$$\int_{-a}^a$$

$$\int M_{ki}(s, x)u_k(s)dB(s)$$

$$\int_0^\infty$$



DDM

Crouch S.L. (1983)

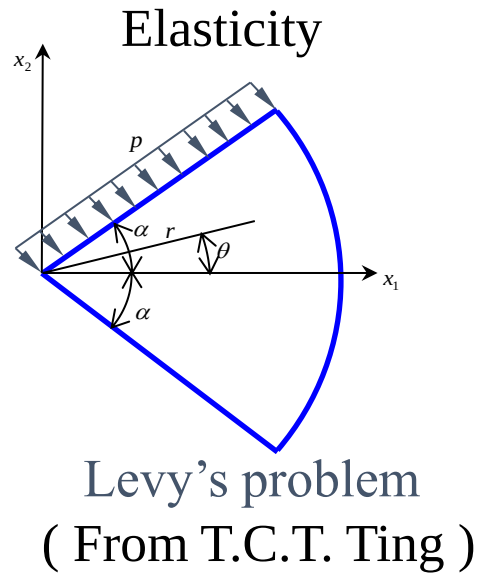
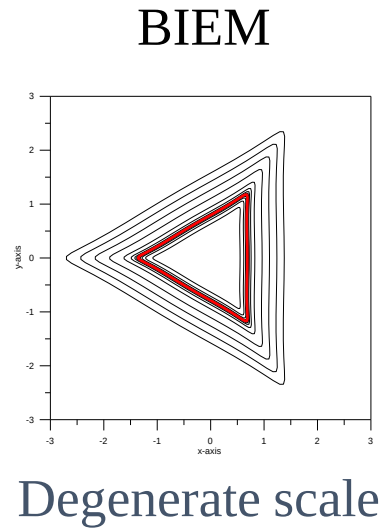
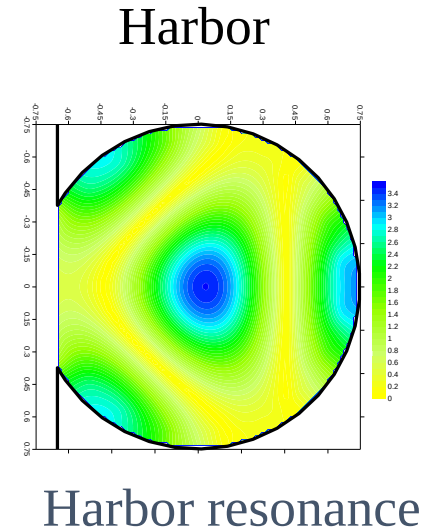
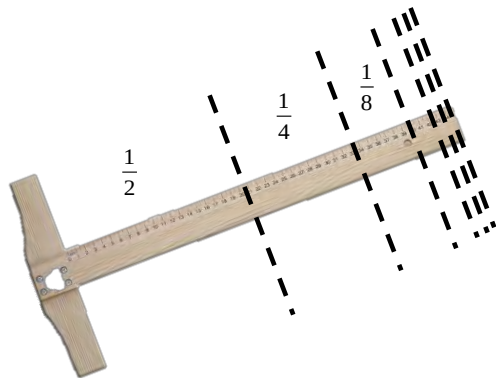


Dislocation theory

Neuber-Papkovitch function

Higher order element
by Shou K.J.

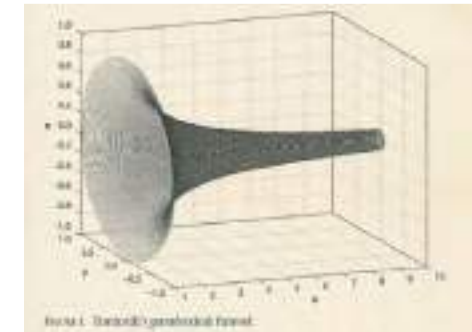
Paradox in mathematics and mechanics (1986-2019)



莊子 日取一半尺



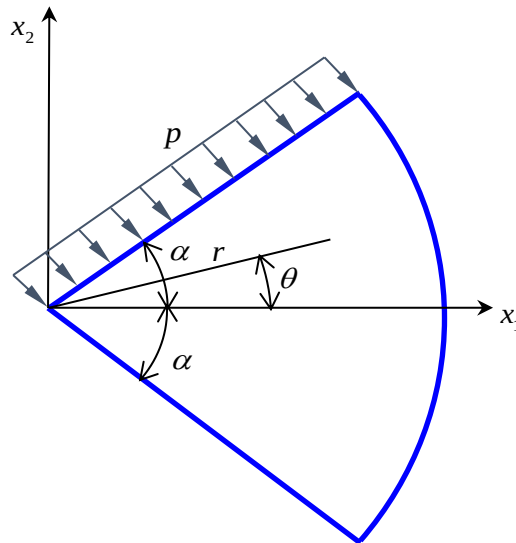
Zeno 人賽不過龜



有限體積無限表面積

Some Paradox (NTOU/MSV)

Angle degeneracy



$$\alpha = \alpha_c$$

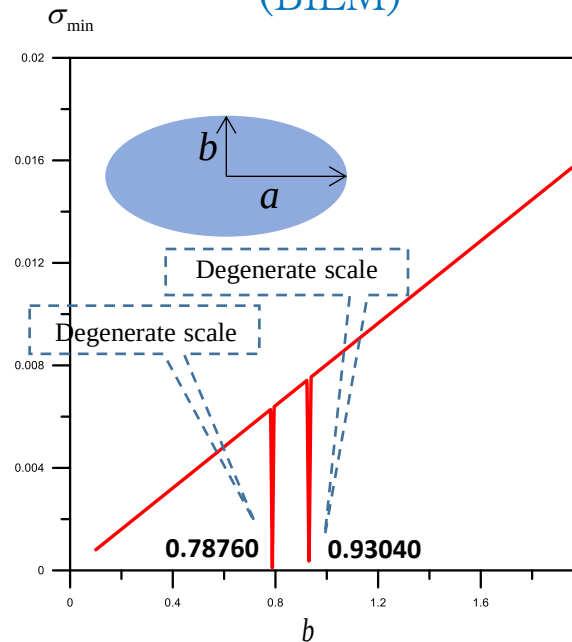
wedge內應力處處無窮大

補reasonable eigensolution



Unique solution

Scale degeneracy (BIEM)



$$2\kappa \left(\ln \frac{a_c + b_c}{2} \right) = \frac{2a_c}{a_c + b_c}$$

$$2\kappa \left(\ln \frac{a_c + b_c}{2} \right) = \frac{2b_c}{a_c + b_c}$$

$$\kappa = 3 - 4\nu$$

$$a = a_c$$

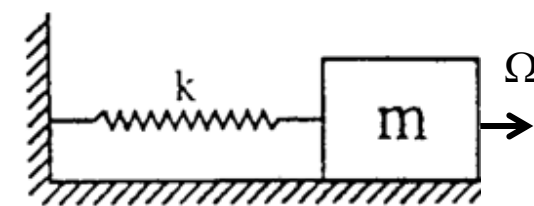
$$b = b_c$$



Nonunique solution

Frequency degeneracy (Resonance)

$\omega = \Omega$ 質點位移 隨時無窮大



$$\ddot{x} + \omega^2 x = \cos(\Omega t)$$

$$x_p(t) = \frac{F}{\omega^2 - \Omega^2} \cos(\Omega t)$$

$\omega = \Omega$ 時，解為無限大。

此時可加一補解，使得

$$x_p(t) = \frac{F \cos(\Omega t) - F \cos(\Omega t)}{\omega^2 - \Omega^2}$$

$$= \frac{Ft}{2\omega} \sin(\omega t)$$

Taiwan role on BEM

Project	Roles
EABE IF=2.138 Best Paper Award since 2018	Editor-in-Chief: Alexander H. D. Cheng Associate Editors: J. T. Chen (2008~2016, 2020~) Editorial Board: D.L. Young & C M Fan
Rizzo Award	Committee: J. T. Chen (only five in the world)
BEM/MRM	Committee: Alexander H. D. Cheng & J. T. Chen
Beteq	Y.C. Shiah
ICOME	J. T. Chen

Taiwan role on BEM.ppt by KT

NTOU/MSV Editorial Staff 2021

(Associate Editor: Chen J T)

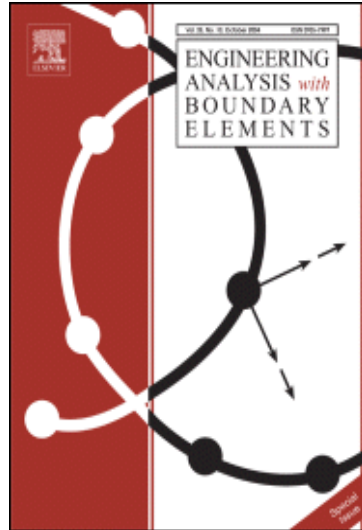


Taylor & Francis
I.F. 0.667/Q4



Secretary

Jeng-Hong Kao
高政宏



Elsevier
I.F. 2.884/Q1



Secretary

Yi-Ling Huang
黃乙玲

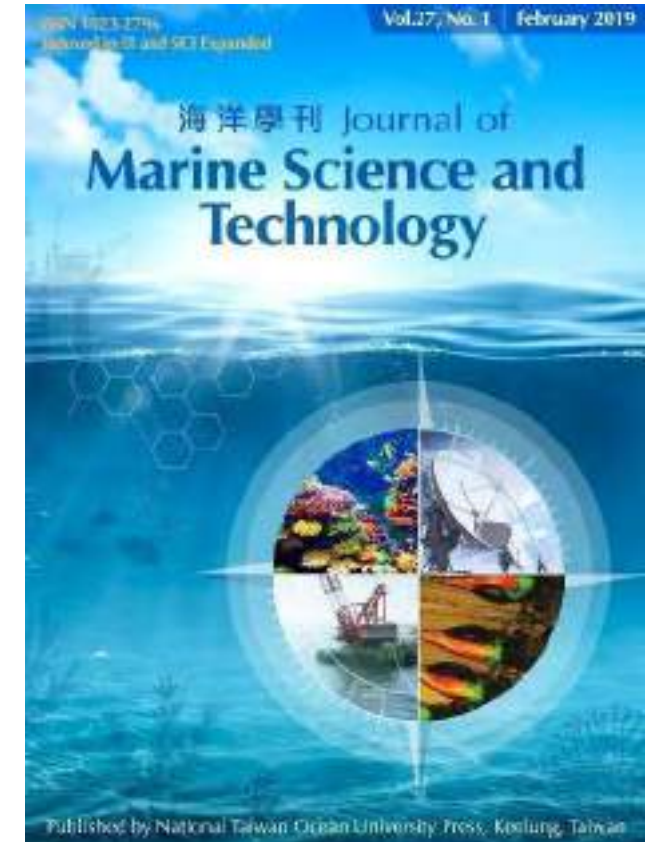


Oxford Univ. Press
I.F. 1.293/Q4



Secretary

Shing-Kai Kao
高聖凱



Elsevier, 2021
I.F. 1.293/Q4
Exective Editor
(1999-2001)

BEM Power in the world (NTOU/MSV)



TOP FIVE

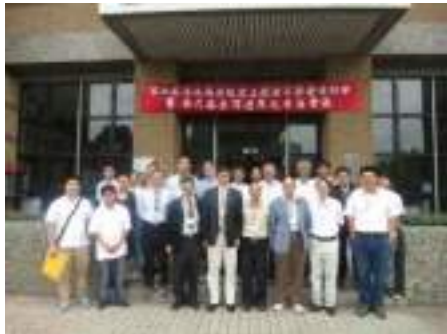
China	Iran	United States	Taiwan	United kingdom
				

History & Background Taiwan BEM workshop (1986-2020) see you in TKU (BEM 12-2021)

Year	The host unit	The organizer	Ceremony	(BEM 11)
1986	NTU IAM	Prof. Y H Pao	 Establishment of NTU IAM	Prof. F J Rizzo
1989	NTU	Prof. D L Young	 NSC	Prof. J A Liggett
1998	NSC	Prof. J T Chen	 NCHC	Prof. A H D Cheng
2010	NTOU-HRE-MSV	Prof. J T Chen	 TOU-HRE 50th anniversary	Prof. Z C Li
2011	NCTS(South)	Prof. K M Lee	 NCKU 80th anniversary	NCKU
2012	Feng Chia University	Prof. Y C Shiah	 Prof. Hong's 60th birthday	Prof. H-K Hong
2013	National Chung Hsing University	Prof. K J Shou	 Congratulations for Academician	Dean S L Crouch Academician, NAE
2014	National SYS University	Prof. T T Lu	 Prof. Young's 70th birthday	Prof. D L Young
2015	NCREE (cross strait)	Dr. R Z Wang	 NCREE	Cross strait ceremony
2016	NCTS (Japan-Taiwan)	Prof. J H Lee	 NCTS	Prof. H-K Hong Prof. W-W Lin
2017	NIU	Prof. I L Chern Prof. K H Chen	 Ilan Univ	Prof. H-K Hong Prof. W-C Wang
2018	ISU	Prof. H T Huang Prof. I L Chen	 Iso univ.	Prof. D L Young
2019	NCKU	Prof. L W Liu	 Cheng Kung Univ	Prof. J T Chen
2020	NTOU	Prof. Y T Lee Prof. C M Fan	 TOU-HRE 60th anniversary	Prof. C B Lin




Taiwan BEM/Meshless Meeting (2010-2020)





2020年 河海工程學系

09:00~15:00	研究室參觀 (系館)
15:00~16:30	校園導覽 (系館 & 校園)
16:30~17:00	系慶大合照 (尚館館)
17:00~20:00	系慶大餐 / 晚餐 (尚樂館)
09:50~19:30	第十一屆 臺灣學術組法與 臺灣元素法學術研討會 <small>(第三二屆研討會、以學術交流第一、臺灣學術)</small>



謹定於中華民國109年10月17日(星期六)
假本校舉行「河工六十周年系慶活動」
敬邀 蒞臨指導

國立臺灣海洋大學	校務委員會主任委員	許學文
	系友會理事長	鍾世榮
		周遠貴

Taiwan BEM/Meshless Meeting (2021)

計算力學論壇/第12屆台灣邊界元會議(2021)－(一)計算固力

日期：2021-11-19(五) 地點：Online meeting

主持人：李家璋 助理教授



時間	講者	題目
10:00-10:15	陳清祥	Kansa RBF collocation method v order BVPs
10:15-10:30	高聖凱	Interaction between a screw inhomogeneity by using the angular
10:30-10:45	高敬宏	Analytical and numerical analysis line segments
10:45-11:00	李家璋	Application of meshfree boundary problems containing an arbitrary s
11:00-11:15	吳南靖	在二維淺水方程無網格數值模式中
11:15-11:30	Li-Wei Liu	Evaluation of bridge with function earthquakes via viscoelastoplastic
11:30-11:45	高浩真	Vibration analysis of a finite bar w support motion on the other side

Organizer: Distinguished Chair Prof. Chen, JT E-mail: jtc@ntou.edu.tw
聯絡人：黃敬宏 博士 E-mail: u02210007@ntou.edu.tw

聯絡網
<http://www.ntou.edu.tw>

計算力學論壇/第12屆台灣邊界元會議(2021)－(二)計算流力

日期：2021-11-19(五) 地點：Online meeting

主持人：吳清森 副教授



時間	講者	題目
13:00-13:15	Jian-Sheng Huang	Magnetic Effect and Temperature-dependent Deposition Mechanism for Flow over a Stretchin
13:15-13:30	廖家德	艦艇上層空氣尾流場數值模擬及特性分析
13:30-13:45	Jian-Sheng Huang	Magnetic Effect and Temperature-dependent Deposition Mechanism for Flow over a Stretchin
13:45-14:00	林錦樺	以 CFD 探討鯉魚游動於水中行進對噴嚏影響之
14:00-14:15	JiaHuan Li	Effect of relative humidity on respiratory droplet coughing and sneezing
14:15-14:30	蘇格輝	以大渦流模擬法分析層化真重流的混合機制

Organizer: Distinguished Chair Prof. Chen, JT E-mail: jtc@ntou.edu.tw
聯絡人：黃敬宏 博士 E-mail: u02210007@ntou.edu.tw

聯絡網：NTOU/MSV
<http://msvlab.ntou.edu.tw>

計算力學論壇/第12屆台灣邊界元會議(2021)－(三)工程分析

日期：2021-11-19(五) 地點：Online meeting

主持人：陳永為 教授

時間	講者	題目
14:30-14:45	歐陽寬	以田口方法探討結合新月形沙丘及三角片孔洞之薄層冷卻效率
14:45-15:00	Shih-Hsien Hou	輪胎打滑動態模擬分析暨應變片開發實做
15:00-15:15	陳新禧	以計算流體力學探討助聽器風扇之研究
15:15-15:30	陳冠傑	鋁合金圓筒承受水下爆震材料應變率影響研究
15:30-15:45	陳治宗	離岸風機塔架吊掛模擬
15:45-16:00	潘政丞	齒輪分析求解水下雜何幾何研究

Organizer: Distinguished Chair Prof. Chen, JT E-mail: jtc@ntou.edu.tw
聯絡人：黃敬宏 博士 E-mail: u02210007@ntou.edu.tw

聯絡網：NTOU/MSV
<http://msvlab.ntou.edu.tw>



Citing:

Chen J T On Hadamard principal value
and boundary integral equation of fracture mechanics

M. Sc. Thesis (應力所碩士論文)

Institute of Applied Mechanics,

National Taiwan University, 1986. (洪宏基教授指導)

論文有機會
用英文寫

1986 NTU IAM 種的因
2003 St Petersburg 得善果



St. Petersburg 2003 (列寧格勒)

Dual BEM 走過三十年(1984-2022)

Yu D. H. (余德浩)	(1983)	中國科學院博士論文(Chinese)
Takakuda K.(高久田)	(1985)	JSME
Chen J. T. (陳正宗)	(1986)	台灣大學應力所碩士論文 supervised by Prof. H. -K. Hong
Ugodchicoff and Khutoryanskiy	(1986)	Kazan Univ. Press (Russian)
Hu H. C.(胡海昌)	(1986)	中國科學中文版(Chinese)
	(1987)	中國科學英文版(English)
Hong H. -K. and Chen J. T. (洪宏基與陳正宗)	(1988)	ASCE,EM
Portela and Aliabadi M. H.	(1992)	IJNME
Chen J T and H K Hong	(1999)	ASME-AMR

邊界元 來結緣 Line group 學術俱樂部

(我們不是邊緣人)



Thanks for your kind attention

感謝 方志中主任 邀請



URL: <http://msvlab.hre.ntou.edu.tw/> Since 1999

U tube: <https://www.youtube.com/watch?v=1d3xr9zdFGg> Since 2015

E mail: jtchen@mail.ntou.edu.tw

Google citing: <http://scholar.google.com/citations?user=CcL1xQoAAAAJ&hl=en>

台灣製造 輸出中國

NTOU/MSV 有您真好

Welcome to visit the web site of MSVLAB/NTOU



E mail: jtchen@mail.ntou.edu.tw



台灣天下
捨我其誰

Welcome to visit NTOU/MSV

MSV
窗外



Taiwan BEM series (2017-2021)

屆數	年代	主持人	主辦地點
8	2017	陳桂鴻 吳清森 李洋傑	宜蘭大學(宜蘭)
9	2018	黃宏財 陳義麟 吳土城	義守大學(高雄)
10	2019	李國明 劉立偉 夏育群 胡潛濱	成功大學(台南)
11	2020	李應德 范佳銘 陳正宗 郭世榮	海洋大學(基隆) 河工系60周年慶
12	2021	李家瑋 李明恭	淡江大學(淡水)

Taiwan BEM series.ppt by KT

ICOME 2023 在台灣

Welcome to visit NTOU/MSV

MSV
窗外





21類學術領域中
工程類
全球 266人
台灣 5人

河海工程學系

Department of Harbor and River Engineering

海洋大學 工學院

陳正宗 特聘講座教授

Thomson Reuters

Highly Cited Researchers (Jan 2013)

NTOU/MSV Web



Our publications

Conferences Information

News

NTOU/MSV 團隊(課題組) 歡迎您



NTOU/MSV 2020團隊(課題組) 歡迎您



NTOU/MSV 2020團隊(課題組) 歡迎您





陳正宗

Jeng-Tzong Chen

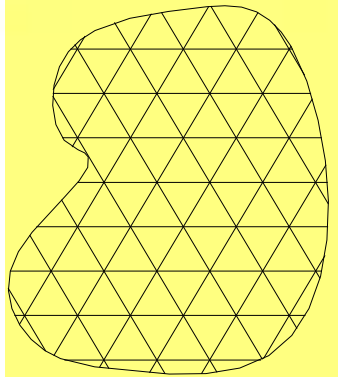
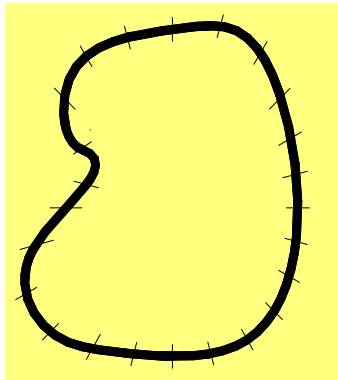
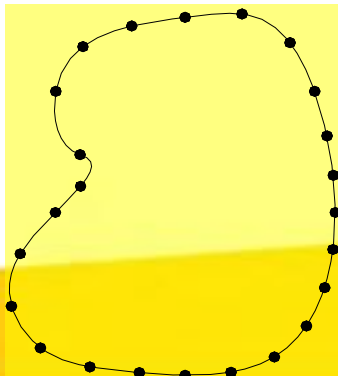


- ▶ 國立臺灣海洋大學河海工程學系特聘講座教授
- ▶ 研究主題：邊界元三十年：

師承宏基邊界元	開創正宗對偶風
三軍五行太極功	鞭辟入裡真輕鬆
領悟零場三分天	分離場源內外通
悖論實虛真面目	只緣身在八卦中

邊界元源於有限元的離散思路

諸元一統



有限元邊界元無單元朝陽結緣

特別解基本解徑向解藍綠合解

為學最樂



有限元邊界元無單元從有到無萬事通

選西瓜 & 煮貢丸都需邊界元



一般邊界

(ordinary boundary)



退化邊界

(degenerate boundary)

Citing:

Chen J T On Hadamard principal value

and boundary integral equation of fracture mechanics

M. Sc. Thesis (應力所碩士論文)

Institute of Applied Mechanics,

National Taiwan University, 1986. (洪宏基教授指導)

論文要用英文寫



St. Petersburg 2003 (列寧格勒)

History (BEM Workshop in 1986)

I was a TA at that time (1986).



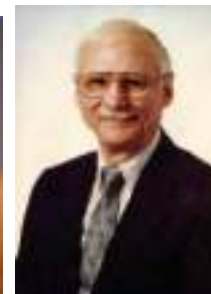
Albert Einstein
1922 lecture in Japan



湯川 秀樹 1949 Nobel
ゆかわ ひでき



F. J. Rizzo



D. J. Shippy



S. Mukherjee

MOE
Academic
Award

62



44

54



55

58



63



Generation of BEM/BIE(E & M)

M

J.-C. Nédélec

祝家麟

袁政強

徐立偉

李小林

李茂軍

Students



M

馮康

余德浩

胡齊芽

杜其奎

康彤

李金

Students



E



Students



M

Onishi



Iso



Kimura

Kazuki NiiNo

Students



E



Yoshiji Niwa

Shoichi Kobayashi



Naoshi Nishimura



Hitoshi Yoshikawa



Ryota Misawa



沈士育

E

鮑亦興

楊德良

洪宏基

陳義麟

陳桂鴻

李國明



Students



葉超雄



黃燦輝

陳正宗

李應德

李家璋

No.
M



陳清祥
(C. S. Chen, USA)



程宏達
(Alex H.-D. Cheng, USA)



陳文, China



中國科學院
劉清泉



陳政清院士



Crouch 院士



石钟慈院士



杜慶華院士



吳漢津
(H C Wu, Iowa, USA)



陳 鞏(Texas A M, USA)



NTOU/MSV visitors



J Bona



A Borthwick
院士



J Sladek 院士



V Sladek 院士



吳鼎文
(T. W. Wu, USA)



陳俊賢
(J S Chen, UCLA)



Jeong-Guon Ih
(KAIST, Korea)



Arnost Marks



香港城大
韓耀宗



祝家麟
(J. L. Zhu, China)



姚振漢
(Yao Z H, China)



余德浩



韓厚德
中國科學院(Han, HD, China)



Zozulya



S Urushadze



S Pospíšil



Jiří Plešek Ivo Štěpánek



中村玄
(G Nakamura, Japan)



劉東杰, China (黃晉, China)



湖南大學
張見明



黃忠億



應文俊



René Marek Slavomír Parma



田中正隆
(M. Tanaka, Japan)



薦原道久
(M. Tsutahara)



磯祐介(Y. Iso)



木須博行
(H Kisu)

My Beginning Since 1994

教學	研究	服務
僅兩位同學來上課，且其中一個是陪另一位來的。	國科會計劃經費 NT\$132,000元起。 研究室空間 3.5 坪	(1)土木水利期刊助手 (洪宏基 教授) (2)中國水利學刊助手 (楊德良 教授) (3)海洋學刊執行編輯 (張順雄 教授) 目前 2 SCI 期刊副主編 5 SCI 期刊編委

無助理教授

6 學分 無6年條款 學生吃苦耐勞
得天下英才 教之

My Engng. Math (III), HRE, NTOU 1994



(Aug., 23, Chen, J T, 1962~)
(1994, 工數三)



(Jan 23, 1862-1943 複變一人)
(David Hilbert, 1862-1943)

工數一定要好好教(老師) 認真學(學生)

台灣製造 輸出中國

- 碩博指導成功案例(SCI)

- 學生念不下去了

- 工數選修？

- 人數不足 (開不成) 微積分也

- 雞同鴨講

- 雞也難過 鴨也難受

要變選修？
力學怎麼辦

台灣天下
捨我其誰



可以算的儘量算 不能算的也要想辦法算



Write what is writable, and make
writable what is not so (科技論文寫作)



Measure what is measurable,
and make measurable what
is not so (SCI Impact factor)

Compute what is
computable, and make
computable what is not so
(工數)

算出來的與量出來的僅供參考
什麼都會算 但不知算什麼 (對或錯?)

工數一定要好好教(老師) 認真學(學生)

台灣製造 輸出中國

- 碩博指導成功案例(SCI)

- 學生念不下去了

- 工數選修？

- 人數不足 (開不成) 微積分也

- 雞同鴨講

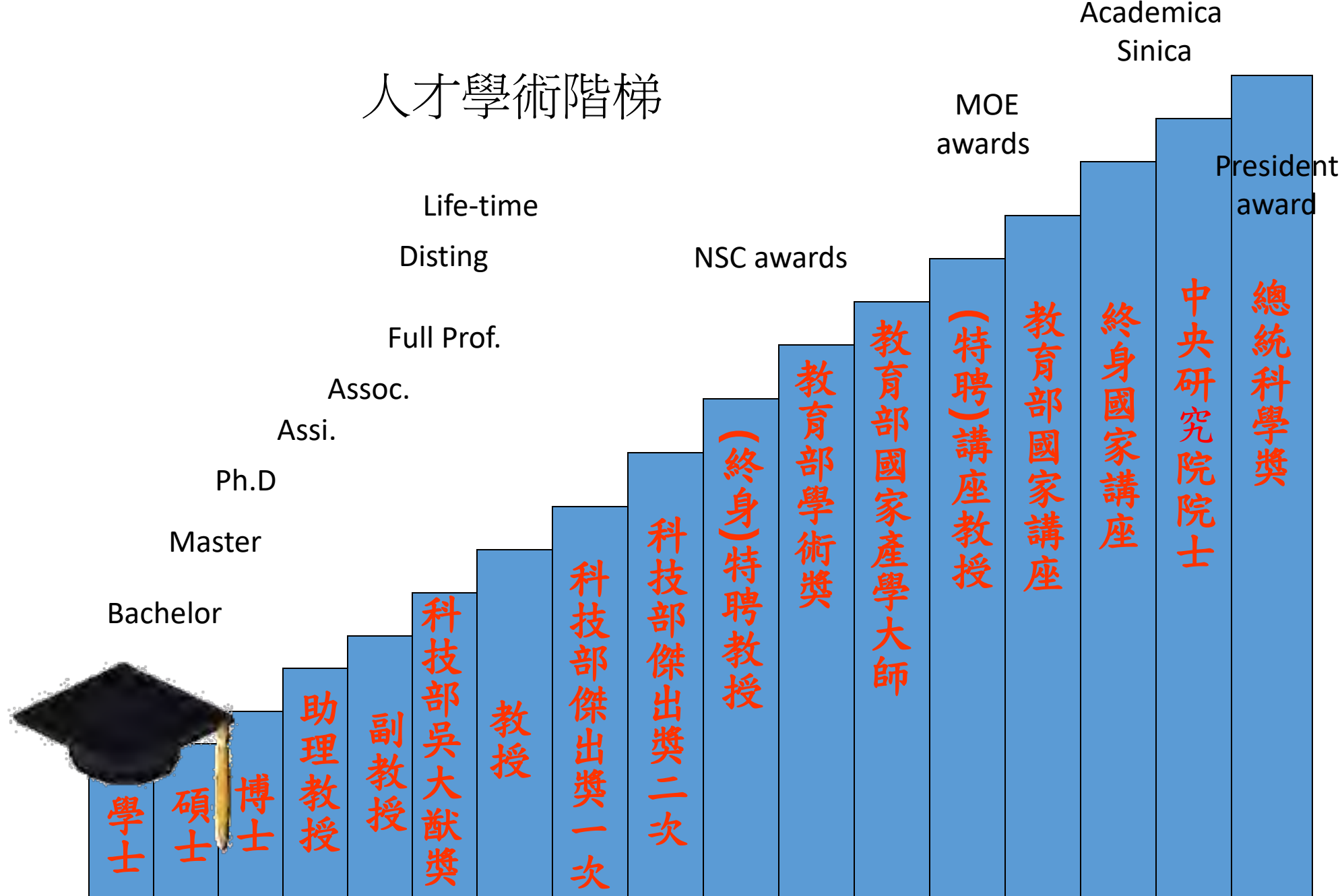
- 雞也難過 鴨也難受

要變選修？
力學怎麼辦

台灣天下
捨我其誰



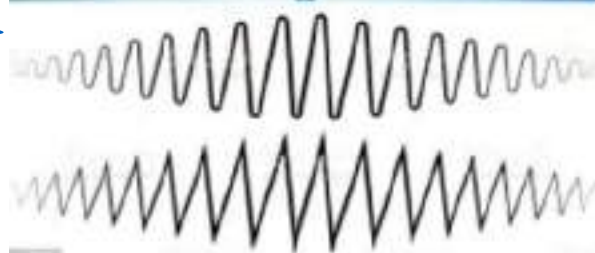
人才學術階梯



說好話
種善因
得良果



Drop a Pebble in the Water



Published in the bulletin (1911) of the Market Street Church of Christ in Athens, Alabama. James William Foley was born on 4 February 1874 in Saint Louis, Missouri. He became a newspaperman and a poet, and was a Poet Laureate of North Dakota. He wrote the poem, "Drop a Pebble in the Water," for his two adolescent sons. He passed away at the age of 65 on 19 May 1939 in Los Angeles, CA.

Drop a Pebble in the Water

By James W. Foley



Drop a pebble in the water: just a splash, and it is gone;

But there's half-a-hundred ripples circling on and on and on,
Spreading, spreading from the center, flowing on out to the sea.

And there is no way of telling where the end is going to be.

Drop a pebble in the water: in a minute you forget,

But there's little waves a-flowing, and there's ripples circling yet,
And those little waves a-flowing to a great big wave have grown;

You've disturbed a mighty river just by dropping in a stone.

Drop an unkind word, or careless: in a minute it is gone;

But there's half-a-hundred ripples circling on and on and on.
They keep spreading, spreading, spreading from the center as they go,
And there is no way to stop them, once you've started them to flow.

Drop an unkind word, or careless: in a minute you forget;

But there's little waves a-flowing, and there's ripples circling yet,
And perhaps in some sad heart a mighty wave of tears you've stirred,
And disturbed a life was happy ere you dropped that unkind word.

Drop a word of cheer and kindness: just a flash and it is gone;

But there's half-a-hundred ripples circling on and on and on,
Bearing hope and joy and comfort on each splashing, dashing wave
Till you wouldn't believe the volume of the one kind word you gave.
Drop a word of cheer and kindness: in a minute you forget;

But there's gladness still a-swelling, and there's joy a-circling yet,
And you've rolled a wave of comfort whose sweet music can be heard
Over miles and miles of water just by dropping one kind word.

送花朵
留手香

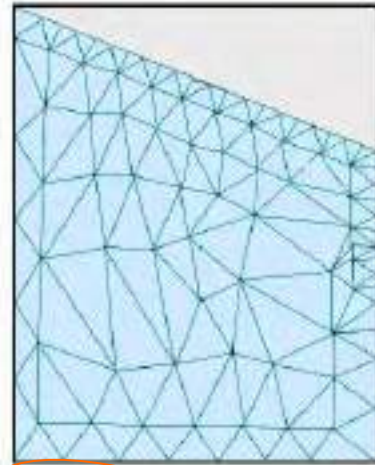
出惡言
難兩全

Seepage with free surface

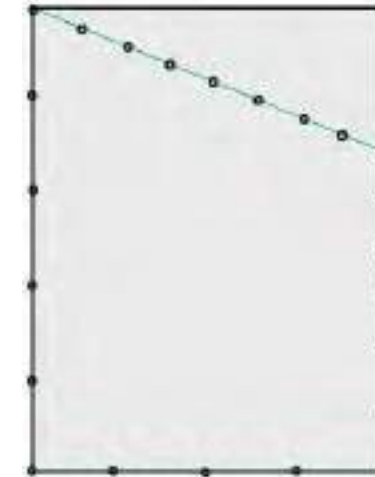
FEM (iteration No.49)

BEM(iteration No.13)

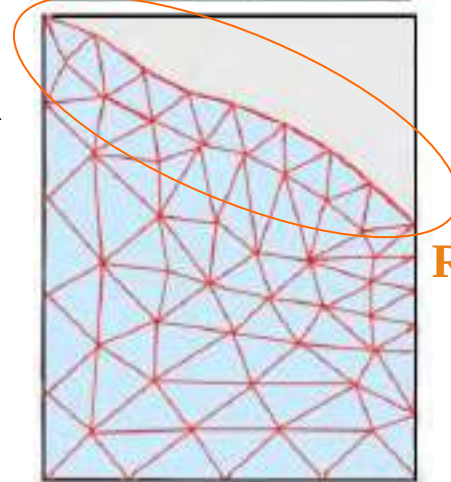
Initial guess



Initial guess



After iteration



After iteration



Remesh area

Remesh line

PARADISE

In the sky, there is a paradise
In the earth, there is Suzhou and Hangzhou
上有天堂 下有蘇杭



Paradise in the Earth

PARASITE

BEM always needs fundamental
solution or Green function
邊界元素法有格林函數與基本解
天堂(paradise)?? 寄生蟲(parasite)??
**Fundamental
solution**

BEM



Green function

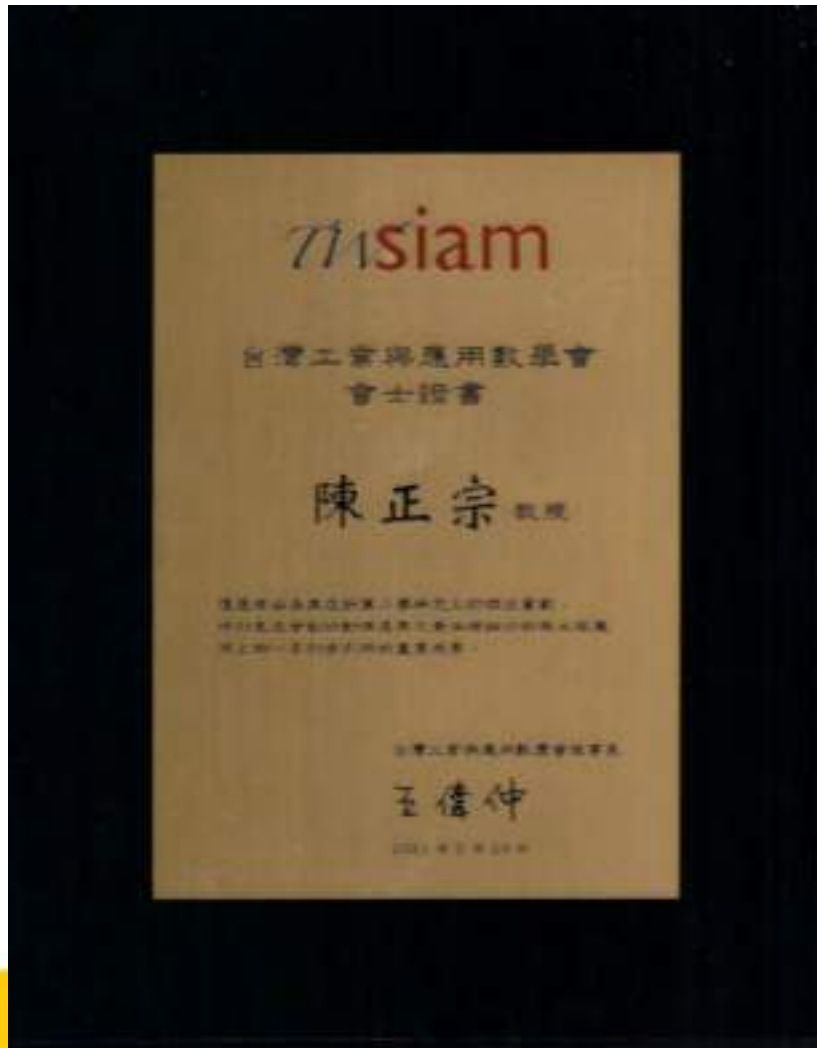
Parasite in the BEM

NTOU/MSV 30 年 光輝紀錄 since 1994



NTOU/MSV 30 年 光輝紀錄 since 1994

(台灣唯一數學力學雙會士)



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