出國報告（出國類別：會議及參訪）

參加『第四屆亞太地區年輕學者及研究人員研討會』會後報告

服務機關：國立屏東科技大學
姓名職稱：徐文信助理教授
派赴國家：香港
出國期間：101 年 12 月 3 日至 101 年 12 月 6 日
報告日期：101 年 12 月 20 日

摘　　要

　　YRGS(Young Researchers and Graduates Symposium)為亞太地區一個提供年輕學者，包括年輕的教授，工程師，博士後研究員或博士班學生交流的平台，研究者可將他們最近最新的研究成果提出討論，研討會以口頭報告的形式交換彼此的研究心得，並提供一個絕佳的機會，讓研究者可對自身的職業進行思考，擘畫未來的走向，透過網狀的交流與聯結，亞太地區的年輕學者可在研討會上充分發展學術上的創意，共重要的是，彼此之間的友誼也可透過研討會開拓並延續。第一屆 YRGS 在韓國 Kunsan 大學舉辦，第二屆則在大陸浙江大學舉辦，第三屆在台灣大學舉辦，本屆則是第四屆，在香港理工大學(The Hong Kong Polytechnic University)舉辦。

　　本次研討會為期兩天，第一天為邀請演講和研討會的進行，第二天則和另一場研討會 PLSE2012(First International Conference on Performance-based and Life-cycle Structural Engineering)合併舉行，第二天下午同時安排工程參觀，參訪香港著名的青馬大橋和汲水門大橋。透過研討會的交流和工程參訪，亞太地區包括日本、香港、加拿大、中國大陸、臺灣、韓國、馬來西亞、澳大利亞、英國、土耳其、美國和印度的年輕學者可交換彼此研究上的心得，並在會議結束後持續保持聯繫，為之後跨國的合作與交流奠定基礎。

目　次

壹、 目的

一、參加第四屆 YRGS(Young Researchers and Graduates Symposium)研討會。

二、透過研討會的形式發表研究成果,除可直接獲得與會貴賓的意見,也可透過積極參與國際研討會,對外呈現台灣研究人員的學術成果,展現台灣在此領域的貢獻。

貳、出國行程及議程

12 月 3 日：

　　下午驅車前往高雄小港機場，搭乘香港航空 HX297 班機，飛機起飛時間為下午 13:30，抵達香港的時間是下午約 15:00，香港與台灣無時差，隨即搭乘香港機場快捷，經青衣到九龍，再搭乘計程車前往預訂的龍堡國際酒店，安置妥善已經接近傍晚 17:00。

12 月 4 日：

　　本次 YRGS2012 會議在香港理工大學舉辦，本次研討會部分時段與另一場次研討會 PLSE2012 重疊，因此第一天(12 月 4 日)是安排在香港理工大學舉辦，第二天(12 月 5 日)則移到富豪九龍酒店舉辦。

　　第一天上午安排來自美國的 Prof. Surendra P. Shah 和日本的 Prof. Tamon UEDA 進行邀請演講，Prof. Shah 的專長在於土木工程的材料，並介紹了流動性相當大的特殊混凝土；Prof. UEDA 則針對年輕學者如何開創未來給予建議，報告中提出了國際接軌的重要性，如何透過網路系統建立跨國的合作團隊，並指出亞洲地區的跨國合作概念確實不若歐美地區，Prof. UEDA 的演講令人印象深刻且發人深省。

　　之後的研討會採平行進行的模式，10:20 至 12:20 有兩個場次同時進行，申請人參加的場次由同濟大學陳建兵教授所主持，與會人員包括加拿大 British Columbia 大學的 T. Y. Yang 教授，湖南大學的研究生王寧，東南大學的王春林教授等人，本場次的研究內容多偏向地震工程對建築物所產生的影響，彼此的互動也相當熱絡。

　　本人進行的研究乃針對特殊地形的場址效應進行受擾動後的反應分析，假設有一半橢圓形沉積谷地的寬度為 $2a$，也是特徵長度，深度為 b。半無限域和沉積谷地的泊松比 (Poisson's ratio)為 1/3，半無限域的密度為 1.0，可得剪力波波速 $C_s = 1.0$，而沉積谷地的波速為半無限域的一半，即 $C_{s0} = 0.5$。假設 SH 入射波以無因次頻率 $\eta = \dfrac{\omega a}{\pi C_s}$，範圍從 0.01 至 2.00；入射角分別為 $0°$、$30°$、$60°$ 及 $90°$，結構物的固有阻尼比 $\zeta = 0.05$，自然頻率 $\eta_n = \dfrac{\omega_n a}{\pi C_s}$，分別為 0.5，1.0 及 1.5，因 SH 入射波的振幅大小均為 1，若地表無不規則散射體，則反應與入射波的頻率及角度無關，且大小均為 2；在高頻入射波的擾動下，在散射體內(此處為半橢圓形沉積谷地)會產生相長性及相消性干涉，即產生多組波峰和波谷的組合。

　　若考慮有一單自由度系統座落於此沉積谷地附近，略去土壤與結構物的互制效應，可直接得到結構物的頻率域反應為地表反應乘上結構物的頻率反應，因此若是結構物本身的自然頻率與沉積谷地的頻率相近，可能會產生放大效應，造成結構物的損壞。從分析得知，深橢圓的沉積谷地會產生較多的自振頻率，其次是半圓形沉積谷地和淺橢圓沉積谷地，但結構物自振頻率的因素，仍可能造成座落於淺橢圓的系統產生較大的振動，在結構物的設計上，顯示場址效應的重要及不可忽視。

由於與會來賓進行的研究多屬結構物受震後的反應分析,對於不同地形可能產生的放大效應較無涉獵,故對於本人的研究內容頗感興趣,於會後的茶點時間也相互繼續討論,對於能引起同行的興趣,進而產生拋磚引玉的效應,也是此行期待的斬獲。

　　下午的場次由 14:00 開始,到 18:00 結束,因第二天安排工程參觀,故大會的閉幕典禮提前舉辦,在議程結束後進行,由香港理工大學的戴建國教授簡介 YRGS 的舉辦歷史緣由,YRGS 第一屆在韓國 Kunsan 大學舉辦,第二屆則在大陸浙江大學舉辦,第三屆在台灣大學舉辦,第四屆在香港理工大學舉辦,也邀請下一屆的主辦國印度的主辦學校 Malaviya National Institute of Technology Jaipur 的代表 Dr. Sandeep Chaudhary 進行明年的會議介紹,本次大會共有將近 50 篇研究成果進行發表,參與國家和地區包括日本、香港、加拿大、中國大陸、臺灣、韓國、馬來西亞、澳大利亞、英國、土耳其、美國和印度,其中以中國大陸的發表成果最為豐碩。閉幕典禮同時還頒發傑出論文獎,這也是 YRGS 第一次舉辦,由 6 位教授進行票選,選出的兩篇都是由日本學者所進行的研究,顯示日本學者在國際研討會上展現的水準和斐然成果,確實值得尊敬和學習。

12 月 5 日:

　　第二天上午的場次是安排在富豪九龍酒店舉行,下午則是由香港理工大學的朱松曄教授及研究生團隊擔任嚮導,安排參觀香港青馬大橋和汲水門大橋,這幾座橋梁連接馬灣、大嶼山和青衣,可通往香港國際機場,汲水門大橋是雙層設計,上層是分隔快速公路,下層則是港鐵機場快線;青馬大橋則是全球最長的行車鐵路雙用懸索吊橋,主纜以空中絞織的方式組成,透過安排,我們也得以進入青馬大橋的內部進行觀察與了解,除了欣賞工程的宏偉與壯觀之外,香港政府另外設置了青嶼幹線觀景台,在洋紫荊公園,以居高臨下的角度觀賞青馬大橋和汲水門大橋的風光,別有一番風味,在公園內部也設計了簡單的模型,藉此說明青馬大橋施工的程序,也有空中纜繩的模型可供參觀,另外也架設了望遠鏡,在欣賞美景之餘,也富有教育意義,確實值得我們學習。

12 月 6 日:

　　上午 8:00 離開龍堡國際酒店,搭乘計程車前往九龍站,轉達機場快捷前往香港機場,搭乘香港航空 HX296 班機,飛機起飛時間為當地 11:35,飛抵台灣小港機場為下午13:00,再行驅車返回屏東市區,時間已是下午 14:30。

香港理工大學 YRGS 研討會會場
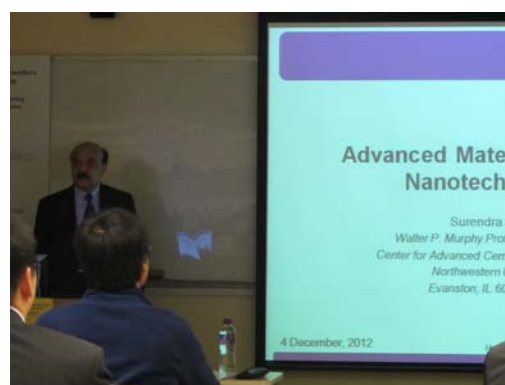
Prof. Shah 進行專題演講
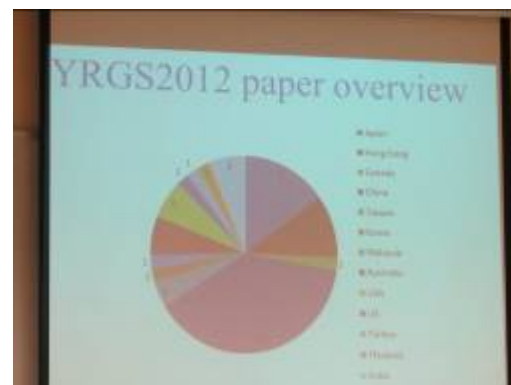
Prof. UEDA 進行專題演講

申請人徐文信進行簡報
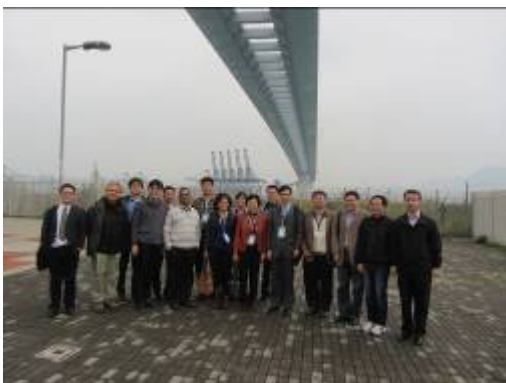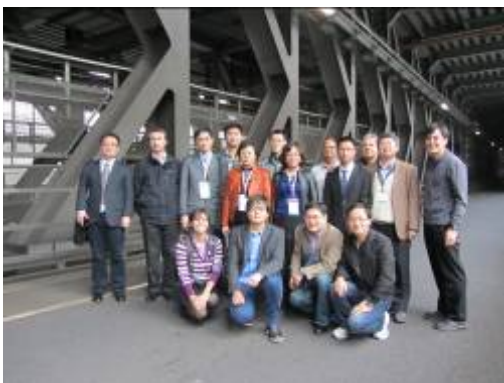

申請人徐文信進行簡報

YRGS2012 論文數量統計

Prof. Maekawa 進行專題演講

與東南大學王文煒教授和 Prof. Sezen 合影

工程參觀合影

參觀青馬大橋內部

工程參觀合影

香港青馬大橋

香港汲水門大橋

香港青馬大橋

參、心得與建議

　　透過參加本次研討會，主要與大陸及香港的學者進行交流，本次會議參加的大陸學校計有東南大學、湖南大學、清華大學、大連理工大學、浙江大學、同濟大學、青島理工大學、揚州大學等多所大學，香港理工大學的兩位年輕教授，本次會議的助理(香港理工大學的博士生)都是大陸出身，也顯示大陸的工程教育相當扎實，在國際研討會的場合當中，大陸學者的積極表現和參與令人印象深刻，同時也足以借鏡，顯示國內學者也應該多參與國際交流，將自己的研究成果透過研討會的形式發表，不僅可以達到與其他國家的學者相互討論的目的，也能營造出如同 Prof. UEDA 所說的國際合作的氛圍，這也是本次參加 YRGS2012 最大的收穫之一。

　　今年同時是香港理工大學創校 75 周年，「凝聚智慧，創建未來」是他們的口號，而理工大學的學生也努力於實踐這樣的理念，學校雖小，但是在校園內仍可看到每位同學充滿自信的步伐，這次因參加研討會，主要是屬於學術研究的交流，對於大學教育的理念和方式未能多加觀察，也希望日後能有更多的時間深入了解。

　　由於香港是著名旅遊景點，能藉由參加研討會之行順道參觀香港，也是許多與會來賓的希望，因此參加第二天活動的貴賓明顯少了許多，部分日本學者前往新加坡繼續開會，部分來賓參加 PLSE2012 研討會，部分貴賓則安排自由行程，因此工程參觀的人數大約只有研討會人數的四分之一，即使主辦單位相當用心，仍不免有所缺憾，這也提供日後舉辦研討會的參考，如何能吸引與會貴賓全程參與，兼顧到學術的知性並且能放鬆心情，讓參加者日後可以有充實且美好的回憶，也是舉辦研討會時必須思考的。

　　本次研討會領取論文集 The Future of Structural Engineering : Research, Practice and Education，ISBN:978-962-367-758-5。

肆、附錄

　　一、大會正式邀請函及詳細會議日程(議程)

　　二、證明論文被接受之文件

　　三、擬發表之論文全文

　　四、未獲國科會補助經費之回函

　　五、申請人最近五年內研究成果之著作目錄

Wen-Shinn SHYU
Department of Civil Engineering
National Pingtung University of Science and
Technology
Taiwan

28 August 2012

Dear **Dr. Wen-Shinn SHYU**,

On behalf of the Organizing Committee of *The 4th Asia-Pacific Young Researchers and Graduates Symposium (YRGS2012)*, I would like to invite you to present your accepted paper at the upcoming YRGS2012 Symposium to be held in Hong Kong, China from 4 to 5 December 2012.

We believe your participation will certainly enhance the quality of the Symposium and ensure its success. The YRGS2012 Symposium will provide a unique opportunity to share and discuss your experience and knowledge and develop collaboration with a wide range of structural engineering researchers from Asia-Pacific regions.

We sincerely hope that you will accept our invitation. We look forward to welcoming you in Hong Kong.

Yours sincerely,

Dr. Jian-guo DAI
Co-Chair, Organizing Committee of
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Department of Civil and Environmental
Engineering
The Hong Kong Polytechnic University
Hong Kong, China
Tel: (+852) 27666026
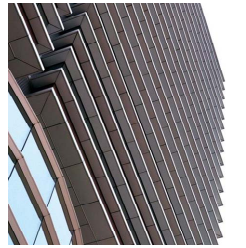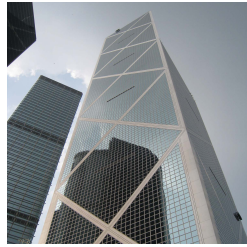Email: cejgdai@polyu.edu.hk

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YRGS 2012

The 4th Asia-Pacific Young Researchers & Graduates Symposium
Hong Kong | 4-5 December 2012

Final Program

THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Welcome to YRGS-2012

The Asia-Pacific Young Researchers and Graduates Symposium (YRGS) series is primarily a platform for early-stage structural engineering professors, research scientists, professional engineers, postdoctoral fellows and PhD students to present their latest findings within the broad discipline of structural engineering. The symposium features oral presentations predominantly from early-career people but also includes talks from leading figures in the field. It provides an opportunity for young structural engineering people to learn about future career paths and to network with fellow researchers. The previous three YRGSs were successfully held at Kunsan National University in 2009, Zhejiang University in 2010 and National Taiwan University in 2011, respectively.

The 4th Asia-Pacific Young Researchers and Graduates Symposium: The Future of Structural Engineering – Research, Practice and Education (YRGS-2012) has accepted forty seven papers from many countries/regions including Australia, Canada, Mainland China, Hong Kong, India, Japan, Korea, Malaysia, USA, UK, Taiwan, Thailand and Turkey. The Symposium will be held at The Hong Kong Polytechnic University on 4-5 December, 2012. It will consist of a two-day technical program: the first day program will be organized in six technical sessions; and the second day program will be a mini-symposium on "Durability and Life-cycle Management of Civil Infrastructures" jointly organized with the First International Conference on Performance-based and Life-cycle Structural Engineering (PLSE 2012) in Hong Kong. Contributions presented at YRGS-2012 deal with the state of the art as well as emerging concept and technology related to research, practice and education in the field of structural engineering.

On behalf of the YRGS-2012 organizing committee and The Hong Kong Polytechnic University, the chairs of the Symposium would like to cordially welcome all the authors and participants. We also take this opportunity to express our sincere thanks to the financial sponsors—Asian Concrete Federation (ACF), The Hong Kong Institute of Steel Construction (HKIC); to the distinguished keynote lecturers—Prof. Surendra P. Shah and Prof. Tamon Ueda; and to all the members of the advisory committee, scientific committee and steering committee.

We look forward to meeting all of you in Hong Kong. We believe with your contribution and participation, the YRGS-2012 will be a successful event.

Jian-Guo DAI & Songye ZHU

Chairs, YRGS-2012
Department of Civil and Environmental Engineering
The Hong Kong Polytechnic University
Hong Kong, China

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Tao YU	University of Wollongong, Australia

Program Overview

3 December 2012	14:30-17:30	Registration	*W703d at HKPolyU*
	18:30-20:30	Steering Committee Meeting	*W703d at HKPolyU*

4 December 2012	08:00-09:00	Registration	*Y520 at HKPolyU*
	09:00-09:20	Opening Ceremony	*Y520 at HKPolyU*
	09:20-09:50	Keynote Lecture I	*Y520 at HKPolyU*
	09:50-10:20	Keynote Lecture II	*Y520 at HKPolyU*

	10:20-12:20	Two parallel sessions
		   Session 1
		   Session 2
			
			Y520 at HKPolyU
			Y511 at HKPolyU

	12:20-14:00	Lunch at *Four Seas Restaurant, S Core, HKPolyU*	

	14:00-15:40	Two parallel sessions
		   Session 3
		   Session 4
			
			Y520 at HKPolyU
			Y613 at HKPolyU

	15:40-16:00	Coffee Break	

	16:00-18:00	Two parallel sessions
		   Session 5
		   Session 6
			
			Y520 at HKPolyU
			Y613 at HKPolyU

	18:30-20:30	Banquet at *SaiKung, N.T.* (A shuttle bus to the venue will be arranged)	

5 December 2012	10:50-12:10	YRGS Mini-symposium in PLSE2012: Session 1D	Longchamps I Room, Regal Kowloon Hotel
	12:10-13:30	Lunch at *Four Seas Restaurant, S Core, HKPolyU*	
	13:30-15:10	YRGS Mini-symposium in PLSE2012: Session 2D	Longchamps I Room, Regal Kowloon Hotel
	15:30-17:30	YRGS Mini-symposium in PLSE2012: Session 3D	Longchamps I Room, Regal Kowloon Hotel
	13:30-17:00	Hong Kong Bridge Tour (A shuttle bus to the venue will be arranged)	
	17:30-18:30	Closing ceremony	Regal Kowloon Hotel

Distinguished Keynote Lecturer

Prof. Surendra P. Shah
Northwestern University
Chicago, USA

Advanced materials through nanotechnology

Biography

Surendra P. Shah is a Walter P. Murphy Professor of Civil Engineering at Northwestern University. He is the Director of the pioneering NSF Science and Technology Center for Advanced Cement-Based Materials. His current research interests include: fracture, fiber reinforced composites, non-destructive evaluation, transport properties, processing, rheology, nanotechnology, and use of solid waste materials. He has co-authored two books: Fiber-Reinforced Cement-Based Composites and Fracture Mechanics of Concrete. He has published more than 400 journal articles and edited more than twenty books. He has served as editor-in-chief of RILEM's journal Materials and Structures.

Professor Shah is a Member of the US National Academy of Engineering. He is also a Foreign Member of the Chinese Academy of Engineering, as well as of the Indian Academy of Engineering. He is the only civil engineer who is a member of these three academies. He has received many awards including the Swedish Concrete Award, ACI Anderson Award, RILEM Gold Medal, ASTM Thompson Award, ASCE Charles Pankow Award, and Engineering News Record's News Maker Award. He was named one the Most Influential People in the industry by Concrete Construction Magazine. He spent time recently as an Honorary Professor at the Indian Institute of Technology, Bombay under a Fulbright grant. Most recently, he was awarded an honorary membership in American Concrete Institute and RILEM (based in Paris).

Besides teaching at Northwestern University, Professor Shah has taught at the University of Illinois at Chicago and served as a visiting professor at MIT, University of Sydney, Denmark Technical University, University of Singapore, Darmstadt Technical University, and LCPC, Paris. He is currently an honorary professor at the Hong Kong Polytechnic University and L'Aquilla University in Italy.

Distinguished Keynote Lecturer

Prof. Tamon UEDA
Hokkaido University
Sapporo, Japan

Expectation to young researchers and graduates in Asia-Pacific for our future

Biography

UEDA Tamon is a Professor at Division of Engineering and Policy for Sustainable Environment of Hokkaido University. He obtained his Doctor of Engineering from University of Tokyo in 1982. His research interests are in numerical analysis of concrete and hybrid structures, prediction of life cycle of structures, upgrading of structures, seismic design and structural design methodology. He has received various national and international awards on his research achievements, such as JSCE Awards, JCI Awards, JPCI Awards, and Awards from international journals (ASCE JCC, Advances in Structural Engineering, Advanced Concrete Technology). He is currently Technical Council Member of the International Federation for Structural Concrete (fib), Advisory Committee Member of International Institute of FRP in Construction (IIFC), President of Asian Concrete Federation (ACF), Former Chairman of International Committee on Concrete Model Code for Asia (ICCMC), Chairman of ISO/TC71/SC7 (Maintenance and Repair of Concrete Structures), Chairman of Concrete Committee of Hokkaido Civil Engineering Association, and Board member and Senior Director of International Activities Center of JSCE.

Program in Details

14:30-17:30	Registration (W703d, W core, HKPolyU)
18:30-20:30	Steering Committee Meeting (W703d, W core, HKPolyU)

Tuesday, 4 December 2012

08:00-09:00	Registration
09:00-09:20	Opening Ceremony (Y520, Y core, HKPolyU)
09:20-09:50	Keynote Lecture I (Y520, Y core, HKPolyU) Chair: Jian-Guo Dai
	Surendra P. Shah, Northwestern University Title: Advanced materials through nanotechnology
09:50-10:20	Keynote Lecture II (Y520, Y core, HKPolyU) Chair: Songye Zhu
	Tamon Ueda, Hokkaido University Title: Expectation to young researchers and graduates in Asia-Pacific for our future
10:20-12:20	Session 1 (Y520, Y core, HKPolyU) Chair: J.B. Chen

T.Y. Yang and D.P. Tung. Performance-based plastic design of linked column frames

N. Wang, J.S. Huo and J.Q. Zhang. Experimental and numerical study on the dynamic behaviours of axially restrained steel beams under impact load

C.L. Wang, Q. Chen, T. Li, S.P. Meng and H.B. Ge. Evaluating the effect of unbonding material for all-steel BRBs

R.J. Liang, J. Wu and S.P. Meng. Verification on the inaccuracy of the equivalent-damping-ratio based capacity spectrum method

W.S. Shyu, M.H. Tsai, J.K. Lu and P.J. Shih. Response of SDOF systems located

near and on elliptical alluvial basins under incident plane SH waves in frequency domain

S.R. Yuan, J.B. Chen and J. Li. Dimension reduction of FPK equation and its applications in seismic response of structures

10:20-12:20	Session 2 (Y511, Y core, HKPolyU) Chair: H.K. Chai

Yasser Bigdeli and Dookie Kim. Active response control of 3D irregular building using neuro-controller

H.K. Chai HK, M. Yorikawa, S. Momoki and M. Terazawa. Damage Assessment of fiber-reinforced concrete beams by stress wave velocity distribution

J. Li and H. Hao. Dynamic condition assessment of shear connectors in composite bridges under ambient vibration

Siu Chun Michael Ho and Gangbing Song. Fiber bragg grating sensor network for the structural health monitoring of a medium scale grout structure

C. Chang, Alamusi, N. Hu and Gangbing Song. Temperature effect on electrical resistivity of MWCNT-epoxy thick film nanocomposites

J.Z. Su, Y. Xia, L. Chen, X. Zhao, Q.L. Zhang and Y.L. Xu. Performance monitoring of the tallest building in China

12:20-14:00	Lunch (Four Seas Restaurant, S Core, HKPolyU)

14:00-15:40	Session 3 (Y520, Y core, HKPolyU) Chair: K. Nagai

Dawei Zhang, Tamon Ueda and Hitoshi Furuuchi. Average crack spacing of overlay-strengthened RC beams

H. Onishi. A mechanical behaviour of RC members overlayed with MMA concrete

A.Y. Jiang, J. Chen and W.L. Jin. Experimental investigation and design of concrete-filled cold-formed thin-walled steel tubes subject to bending

R.K. Gupta, K.A. Patel, S. Chaudhary and A.K. Nagpal. An efficient finite element model for flexible composite structures

R.K. Sharma and P. Chowdhary. Effect of relative humidity on creep-shrinkage behaviour of composite frame systems

14:00-15:40	Session 4 (Y613, Y core, HKPolyU) Chair: D.W. Zhang

Kohei Nagai and Daisuke Hayashi. An analytical investigation of anchorage performance of mechanical anchorage by 3D discrete model

Caglar Goksu, Pinar Inci and Alper Ilki. The bond-slip behaviour of extremely low

strength RC columns with corroded plain reinforcing bars

W. Soonjun, D. Yodmalai, R. Sahamitmongkol, S. Tangtermsirikul. Improvement of resistance against carbonation and chloride penetration of concrete by crystalline coating material

Zuanfeng Pan and Zhitao Lu. Sensitivity analysis of time-dependent deflection in long-span prestressed concrete continuous bridges

L.C. Wang and S.H. Li. Capillary absorption of concrete after subjected to mechanical loading

15:40-16:00	Coffee Break
16:00-18:00	Session 5 (Y520, Y core, HKPolyU) Chair: Y.C. Koay

X. Wang, W.W. Wang, J.G. Dai and F. Zhao. FE analysis of GFRP-concrete composite bridge decks using a mixed element approach

D. Fernando, T. Yu and J.G. Teng. Behaviour of CFRP laminates bonded to a steel substrate using a ductile adhesive

Y.L. Wang, Y.Y. Li and J.H. Ran. Structural performance of hybrid FRP-concrete beam

H. Sezen. Retrofit of reinforced concrete beam-column joints and columns using fiber reinforced polymer

Yu Jia Huan and Yang Li. Experimental study on FRP reinforced PP ECC beams under reverse cyclic loading

Yu Jia Huan and Yang Li. Application of interfacial propagation and kinking crack concept to ECC/concrete overlay repair system

16:00-18:00	Session 6 (Y613, Y core, HKPolyU) Chair: H. Sezen

Jianfeng Dong, Yuxi Zhao, Yingyao Wu, Liang Ye. Experimental study on corrosion process of steel bar in recycled concrete

Y.C. Koay. Concrete made with geopolymer: an alternative cement reducing the carbon dioxide emissions-the VicRoads experience

H.L. Su, J. Yang, M. Waterhouse, I. McNicholas and J.T. Kang. Properties of concrete with recycled rubber material

Wit Rattanachot, Yuhong Wang, Dan Chong and Xueying Li. Method of incorporating flood effects into flexible pavement structural analysis

W.Q. Wu, X.Y. Ma and S. Chen. Feasibility study of bamboo strip plywood used in structure engineering on the basis of its compressive mechanical properties

S. Zhu, X. Shi, R. Leung, S. Ng and L. Cheng. The effect of construction induced vibration on sensitive medical equipment: a case study

18:30-20:30	Banquet (Sai Kung, N.T. Around 40-min drive from HKPolyU. A shuttle bus to the venue will be arranged.)

Wednesday, 5 December 2012

9:50-12:10	**YRGS Mini-symposium in PLSE2012 Conference: Session 1D** (Longchamps I Room, Regal Kowloon Hotel) Chairs: Jian-Guo Dai & Songye Zhu

T. Ueda. Meso-scale approach for service life prediction of concrete structures under combined effects (Invited Paper)

F. Gong, E. Sicat and T. Ueda. Mesoscopic deterioration model for mortar under freezing and thawing cycles.

An Duan and Jian-Gauo Dai. A probabilisteic approach for durability design of concrete structures in marine environments

X.P. Zhong, W.L. Jin, Y. Wang and L. Huang. Life-cycle performance and its indexes of concrete structures

12:10-13:30	Lunch (Four Seas Restaurant, S Core, HKPolyU)

13:30-15:10	**YRGS Mini-symposium in PLSE2012 Conference: Session 2D** (Longchamps I Room, Regal Kowloon Hotel) Chairs: Jian-Guo Dai & Yoshikazu Kobayashi

F.X. Jiang, F.H. Wittmann and T.J. Zhao. Influence of sustained compressive load on penetration of chloride ions into neat and water repellent concrete (Invited Paper)

Yuxi Zhao, Hongwei Lin, Kang Wu and Weiliang Jin. Bond-slip relationship between normal/recycled concrete and corroded steel bars

Dujian Zou, Tiejun Liu and Guofu Qiao. Experimental investigation on the dynamic properties of RC structures affected by reinforcement corrosion

X.X. Chen, Z.H. Li, Z.Z. Hu and Z.P. Shen. Key technical research and platform development of bridge management system

Ye Qian, Dawei Zhang and Tamon Ueda. Interfacial bonding of concrete-ordinary Portland cement mortar under freezing thawing cycles

15:30-17:30	**YRGS Mini-symposium in PLSE2012 Conference: Session 3D** (Longchamps I Room, Regal Kowloon Hotel) Chairs: Jian-Guo Dai & Sandeep Chaudhary

Chung-Che Chou, Ying-Chuan Chen, Dinh-Hai Pham and Vu-Minh Truong.

Seismic performance and durability assessment of a new steel dual-core self-centering brace with FRP composite tendons

H.W. Huang, Y.S. Sun and J.N. Yang.   Damage identification of a cable-stayed bridge model using sequential nonlinear LSE approach

Y. Kobayashi and T. Shiotani.   System identification with the Kalman filter in ray-trace based AE-tomography

K.F. Chung and M.H. Shen.   Shear resistances of shear connections with composite slabs using headed studs and local aggregates in Hong Kong.

Xueqing Zhang and Hui Gao.   A continuous-time semi-Markov model for road maintenance optimization

13:30-17:00	Hong Kong Bridge Tour (A shuttle bus to the venue will be arranged)
17:30-18:00	Closing Ceremony (Longchamps I Room, Regal Kowloon Hotel)

Symposium Venue

- ✓ The YRGS-2012 parallel sessions on 4 December 2012 will be held on the campus of The Hong Kong Polytechnic University (HKPolyU);
- ✓ The mini-symposium on 5 December will be held in Regal Kowloon Hotel, the venue of PLSE 2012 conference.

Around 8 mins walk from HKPolyU to Regal Kowloon Hotel

Transportation from Hong Kong International Airport to HKPolyU or nearby hotels:

By Taxi: Cost about HK$ 230

By MTR: Take the MTR and get off at the terminus Hung Hom Station

MTR System Map

http://www.mtr.com.hk/jplanner/images/maps/routemap.pdf

By Shuttle Bus   Many hotels provide shuttle bus service from Hong Kong International Airport. Please check with the hotel when you make your reservation

Map of East Tsim Sha Tsui

HK PolyU
(YRGS 2012)

Train Station

Regal Kowloon Hotel
(PLSE 2012 conference)

Accommodation

Hotels may provide shuttle bus from/to Hong Kong International Airport

1) Regal Kowloon Hotel

Address: 71 Mody Road, Tsimshatsui, Kowloon , Hong Kong

Website : www.regalhotel.com

Phone: (852) 2313 8637

Fax: (852) 2311 8900

Email: rkh.mice@regalhotel.com

2) Harbour Plaza Metropolis

Address: 7 Metropolis Drive, Hunghom, Kowloon, Hong Kong

Website : www.harbour-plaza.com/hpme

Phone: (852) 3160 6890

Fax: (852) 3160 6988 / (852) 3160 6989

Email: RayN@harbour-plaza.com

3) Hotel ICON

Address: 17 Science Museum Road, Tsim Sha Tsui East, Kowloon, Hong Kong

Website : www.hotel-icon.com

Phone: (852) 3400 1688

Fax: (852) 3400 1689

Email: book@hotel-icon.com

4) InterContinental Grand Stanford Hotel

Address: 70 Mody Road, Tsimshatsui East, Kowloon, HK.

Website : www.hongkong.intercontinental.com

Tel: (852) 2731 2882

Fax: (852) 2723 5121

Email: reservation@grandstandford.com

5) Holiday Inn Golden Mile Hong Kong

Address: 50 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong

Website: www.holidayinn.com/hongkong-gldn

Direct: (852) 2315 1234

Fax: (852) 2723 1957

Email: Meris.lam@goldenmile.com

6) BP International

Address: No.8 Austin Road, Tsim Sha Tsui, Kowloon, Hong Kong.

Website : www.bpih.com.hk

Tel: (852) 2376 3335

Fax: (852) 2376 1333

Email: ivywong@bpih.com.hk

Useful Links

Hong Kong Tourism Board

 Please visit the website of the Hong Kong Tourism Board to find more details of attractions, shopping, dinning, etc.   http://www.discoverhongkong.com/eng/index.html

Weather

 Please visit the website of Hong Kong Observatory to find the latest weather forecast of Hong Kong.   http://www.hko.gov.hk/contente.htm

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        &

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Dear Dr. Shuy,

We are pleased to inform that your paper submitted to YRGS2012 has been accepted after the review organized by the local organizing committee. Please consider the reviewer's comments as shown below and send a final version in Both WORD format and PDF to Dilys at cewmng@polyu.edu.hkbefore 8 Oct.

We look forward to receiving your paper and welcoming you in Hong Kong.

Reviewed Comments

This paper presents seismic respond of SDOF systems under incident plane SH waves. A hybrid method is proposed for surface motion of elliptical alluvial basins. The paper is well written and I would like to recommend accepting this paper for the publication in the conference proceedings. But the authors should consider making the following revision(s):

1. The line spacing in some part of the paper is incorrect. A single-line spacing should be used according to the template.

Best Regards,

Dr. Jian-Guo Dai
Co-Chair, Organizing Committee of YRGS-2012

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<http://www.polyu.edu.hk/cpa/75thanniversary/index.php>

75th Anniversary of The Hong Kong Polytechnic University
INNOVATION AND APPLICATION FOR THE FUTURE

75th Anniversary of The Hong Kong Polytechnic University
INNOVATION AND APPLICATION FOR THE FUTURE

RESPONSE OF SDOF SYSTEMS LOCATED NEAR AND ON ELLIPTICAL ALLUVIAL BASINS UNDER INCIDENT PLANE SH WAVES IN FREQUENCY DOMAIN

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ABSTRACT

Extended from a previous study of a semi-circular alluvial basin, responses of surface ground motion under incident plane SH wave excitations for elliptical alluvial basins located on an elastic half-plane is investigated. Analytical backgrounds of a proposed hybrid method for the surface ground motion of elliptical alluvial basins are introduced. Numerical analysis results indicate that the surface ground motions are dominated by a series of peaks in frequency domain. Considering different incident angles and natural frequencies, displacement responses of single degree-of-freedom systems (SDOF) located near and on the elliptical alluvial basins under the generated surface ground motions are discussed. Analysis results reveal that the vibration characteristics of structures and site effect should be simultaneously considered in the estimation of seismic response.

KEYWORDS

alluvial basin, SH wave, hybrid method, SDOF, site effect

INTRODUCTION

Effect of surface irregularity on the ground excitations is essential for seismic design of important facilities. Because of the wave scattering and diffraction by surface irregularity, local geological conditions may generate significant amplifications and spatial variations of ground motion. Exact analytical solutions were obtained for the scattering of plane SH waves propagating through simple surface shapes, such as a semi-cylindrical alluvial basin or a semi-elliptical alluvial basin (Trifunac 1971, Wong and Trifunac 1974). Although there were several techniques proposed for solving these problems, the details were different from case to case. Yeh *et al.* (2000a, 2000b, 2007) have used a hybrid method which combines the finite element and series expansion method to solve the radiation problem and scattering problems in an elastic half-plane. A mapping function was introduced by Shyu *et al.* (2008, 2009, 2010) to mesh the surface irregularities and several cases were studies. Based on the previous study results, this paper presents the seismic response of SDOF systems located near or on a semi-elliptical alluvial basin subjected to SH wave. The hybrid method is adopted to obtain the ground surface displacements of a semi-elliptical alluvial basin with different ratios of axis length under incident SH waves. Then, the frequency response function of displacement is calculated for an elastic SDOF system subjected to the surface displacement. Soil-structure interaction between the SDOF model and the basin is not considered in this study.

PROBLEM DESCRIPTION

Fig.1 shows a SDOF system located on an alluvial basin. The case of a semi-circular basin was discussed by Shyu *et al.* in 2012. In this study, the case of a semi-elliptical alluvial basin is considered. The semi-elliptical alluvial basin with an axis width $2a$ is embedded in an elastic half-plane and is excited by a unit-amplitude plane SH wave with circular frequency ω and incidence angle θ. Let the elastic half-plane be divided into Ω and Ω^0 by a semi-circular interface C. Ω^0 is defined as a finite domain enclosing the semi-elliptical alluvial basin. It is assumed that the material of alluvial basin is softer than the half-plane. Frequency response functions of the elastic SDOF located on a shallow and a deep semi-elliptical alluvial basin are compared.

ANALYSIS APPROACH

The hybrid method

According to the hybrid variational formulation, an analogous hybrid approach has been proposed by Yeh *et al*. (2000a) to solve the boundary value problem. The interior domain Ω contains the irregular area and the finite domain Ω^0 may be discretized into finite element mesh. Traction free condition at ground surface and the radiation condition at infinity are satisfied by scattered waves which can be represented by Lamb's solution. The unknown boundary data may be obtained by subtracting the known free fields from the total fields that include the boundary nodal displacements and tractions at the interface between the finite domain and the surrounding elastic half-plane. It may be expressed in a matrix form as

$$\begin{bmatrix} \mathbf{K}^{aa} - \omega^2 \mathbf{M}^{aa} & -\mathbf{K}^{ac} \\ -\mathbf{K}^{ca} & \mathbf{K}^{cc} \end{bmatrix} \begin{Bmatrix} \mathbf{a} \\ \mathbf{c} \end{Bmatrix} = \begin{Bmatrix} \mathbf{P}^a \\ -\mathbf{P}^c \end{Bmatrix} \tag{1}$$

Therefore, the displacement field in each element can be represented by the vector of nodal displacement $\{\mathbf{a}\}$. The scattered waves can be formulated through a series representation with unknown coefficients $\{\mathbf{c}\}$. The detailed formulation has been established by Shyu (2002).
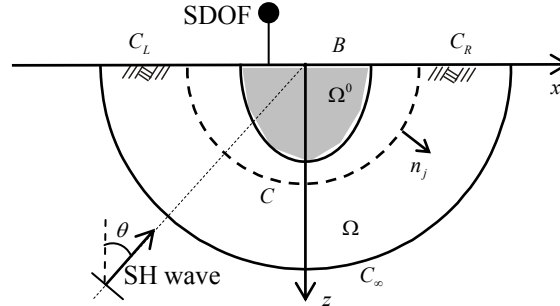

Fig. 1. A sketch of the problem in an elastic half-plane Ω which is homogeneous except in a finite region Ω^0 bounded by surface irregularity with surface B and a semi-circular interface C.

Response of SDOF

Consider a harmonic ground displacement excitation expressed as

$$u_g(\bar{x}, t) = U_g(\bar{x}) e^{i\omega t} \tag{2}$$

The corresponding steady-state displacement time history of an elastic SDOF system may thus be expressed as

$$u(\bar{x}, t) = U(\bar{x}) e^{i\omega t} \tag{3}$$

The normalized variable $\bar{x} = x/a$ is the position where the SDOF system is located at. $U_g(\bar{x})$ and $U(\bar{x})$ are the displacement amplitudes of the ground motion and the SDOF system in frequency domain, respectively. Assume that the SDOF system has a lumped mass represented by m, elastic stiffness k, and damping coefficient c. The equation of motion for this SDOF system may be written as

$$m\ddot{u} + c\dot{u} + ku = -m\ddot{u}_g \tag{4}$$
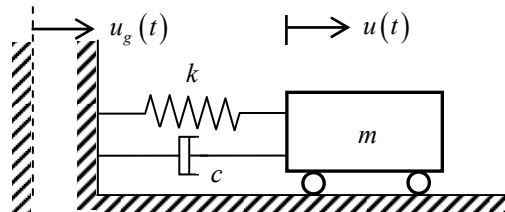
A sketch of this system is shown in Fig. 2.

Fig. 2. Influence of support excitation on SDOF system located on a fixed position $\bar{x}$.

The substitution of (2) and (3) into (4) yields

$$-m\omega^2 U + i\omega c U + kU = m\omega^2 U_g \tag{5}$$

And $U(\bar{x})$ is solved as

$$U = \frac{-m\omega^2}{m\omega^2 - i\omega c - k} U_g \tag{6}$$

or

$$U = HU_g \tag{7}$$

where

$$H = H(\zeta, \beta) = \frac{\beta^2}{\beta^2 - 2i\zeta\beta - 1} \tag{8}$$

and ζ is the damping ratio which is defined as

$$\zeta = \frac{c}{2m\omega_n} \tag{9}$$

β is defined as the ratio of applied frequency to the natural frequency $\omega_n = \sqrt{k/m}$. It is expressed as

$$\beta = \frac{\omega}{\omega_n} \tag{10}$$

Numerical Solution

Ground surface displacement of the semi-elliptical alluvial basin subject to SH wave is solved by the aforementioned hybrid method. Assume that $2a$ is the width of the semi-elliptical alluvial basin and b is the depth of the alluvial basin. A ratio b/a of 0.75 is chosen as a shallow alluvial basin and 1.5 as a deep alluvial basin. The domain Ω^0 is meshed as 800 Q8 elements and 2521 nodes included the alluvial basin. The mesh distributions of the semi-elliptical alluvial basin are shown in Fig. 3. The semi-elliptical alluvial basin is subjected to incident SH waves with dimensionless frequency $\eta = 2a/\lambda = \omega a/\pi C_s$, which is defined as the ratio of the width of the semi-elliptical alluvial basin to the wave length λ. $C_s = \sqrt{\mu/\rho}$ is the shear wave speed, where μ and ρ represent the shear modulus and density, respectively. Let the modulus ratio $\mu_{(b)}/\mu = 1/6$ and density ratio $\rho_{(b)}/\rho = 2/3$, where the subscript b is referred to the alluvial basin. Based on these parameters, the speed ratio $C_s/C_{s(b)} = \sqrt{(\mu\rho_{(b)})/(\rho\mu_{(b)})} = \sqrt{2/3/1/6} = 2.0$. The ground surface displacement amplitudes $U_g(\overline{x})$ of the shallow and deep alluvial basins under the SH waves with varied dimensionless frequency η and incident angles are shown in Fig. 4 and Fig. 5, respectively. The displacement amplitude of the half-plane surface without irregularities is equal to 2.0 and is independent of the incident angles θ and dimensionless frequency η. For practical engineering, it is useful to examine the displacement amplitudes of the ground motion at different surface location of the half-plane. The figures indicate that the influence of the semi-elliptical basin on the surface displacement amplitude increases with η. In the meantime, complexity of the amplitude variation increases as well. The deep alluvial basin may lead to more complex variation of displacement amplitude than the shallow alluvial basin.

According to the frequency response function of an elastic SDOF system as shown in Eq.(8), it may be further expressed in terms of the ratio of η and dimensionless natural $\eta_n = \omega_n a/\pi C_s$ as

$$H(\eta) = \frac{(\omega/\omega_n)^2}{(\omega/\omega_n)^2 - 2i\zeta(\omega/\omega_n) - 1} = \frac{(\eta/\eta_n)^2}{(\eta/\eta_n)^2 - 2i\zeta(\eta/\eta_n) - 1} \tag{11}$$

Typical frequency response H with $\zeta = 0.05$ and $\eta_n = 0.5, 1.0, 1.5$ is shown in Fig. 6. It is seen that the frequency response curves are similar since they present the dynamic characteristics of the elastic SDOF system only. As the ground surface displacement amplitude is considered, the displacement response of the SDOF system may be obtained from Eq.(7). For the case of $\eta_n = 0.5$, the displacement amplitudes $U_g(\overline{x})$ of the SDOF system located on the shallow and deep alluvial basins subjected to the SH waves with varied

dimensionless frequency η and incident angles are shown in Fig. 7 and Fig. 8, respectively. It is seen that the shallow alluvial basin may induce single significant displacement amplification as the SDOF system is located at the center of the basin. However, multiple significant amplifications may be observed from the response of the same SDOF system located on the deep elliptical basin.

Fig. 9 shows the frequency response of the surface displacement and the SDOF displacement at the center location of three different alluvial basins under the SH wave with an incident angle $\theta = 0$. It is seen from Fig. 9(a) that in the definite range of η, the shallow alluvial basin has similar local maximum response to a semi-circular basin, while the deep alluvial basin presents more and larger local maximums as $\eta > \eta_n$. The dimensionless resonance frequencies corresponding to those local maximums of surface displacement are summarized in Table 1. In Fig. 9(b), the SDOF presents a larger resonant displacement response at $\eta = \eta_n = 0.5$ as located on the shallow alluvial basin since its natural frequency is closer to its first resonant frequency. However, for incident SH waves with $\eta > \eta_n$, the SDOF may have larger displacement response as located on the deep alluvial basin. These evidences indicate that the local site effect is crucial for the structural response under ground motions.
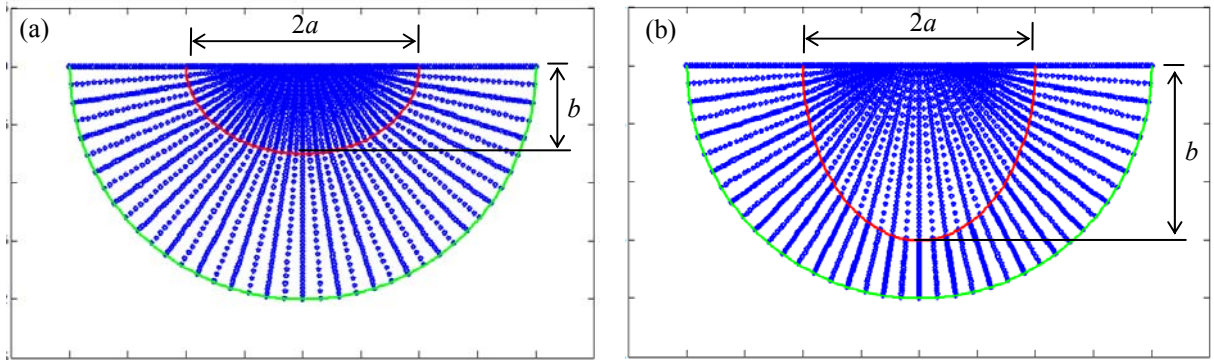

Fig. 3. Mesh grid for (a) a shallow semi-elliptical alluvial basin with $b/a = 0.75$,
(b) a deep semi-elliptical alluvial basin with $b/a = 1.5$ contained in an elastic half-plane.
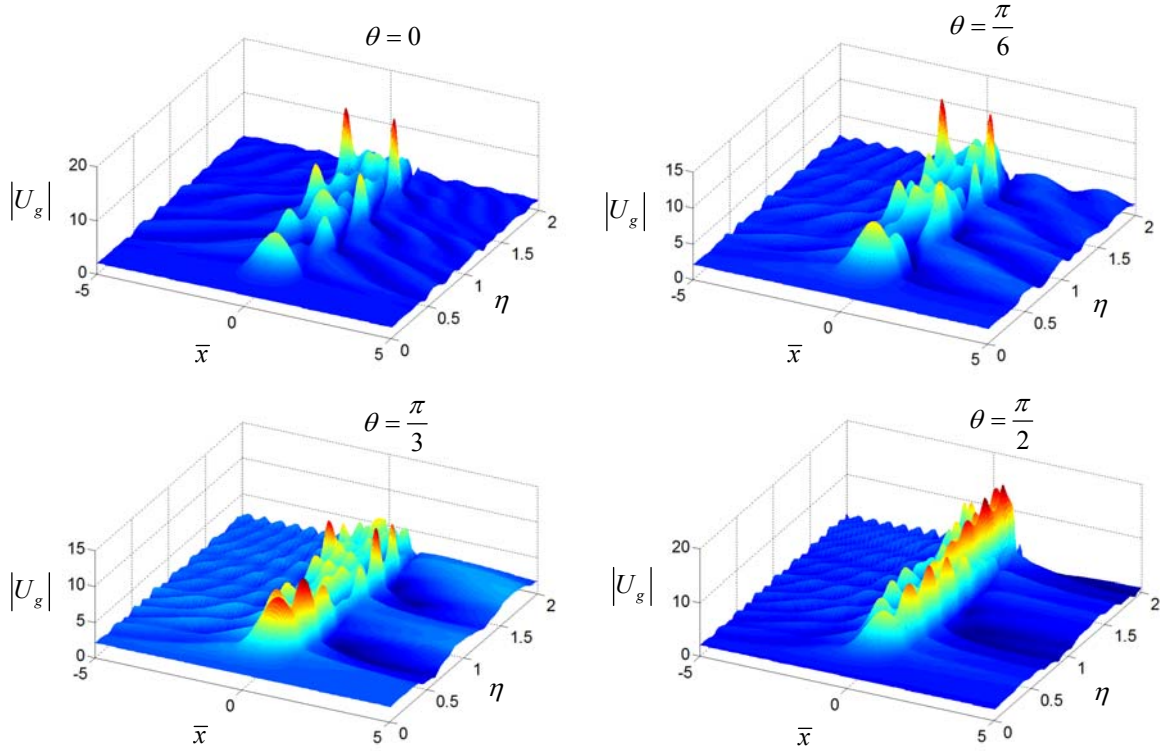

Fig. 4. Ground surface displacement amplitudes $\left| U_g \left(\overline{x} \right) \right|$ of a shallow semi-elliptical alluvial basin with
$b/a = 0.75$ vs. $\overline{x}$ and η
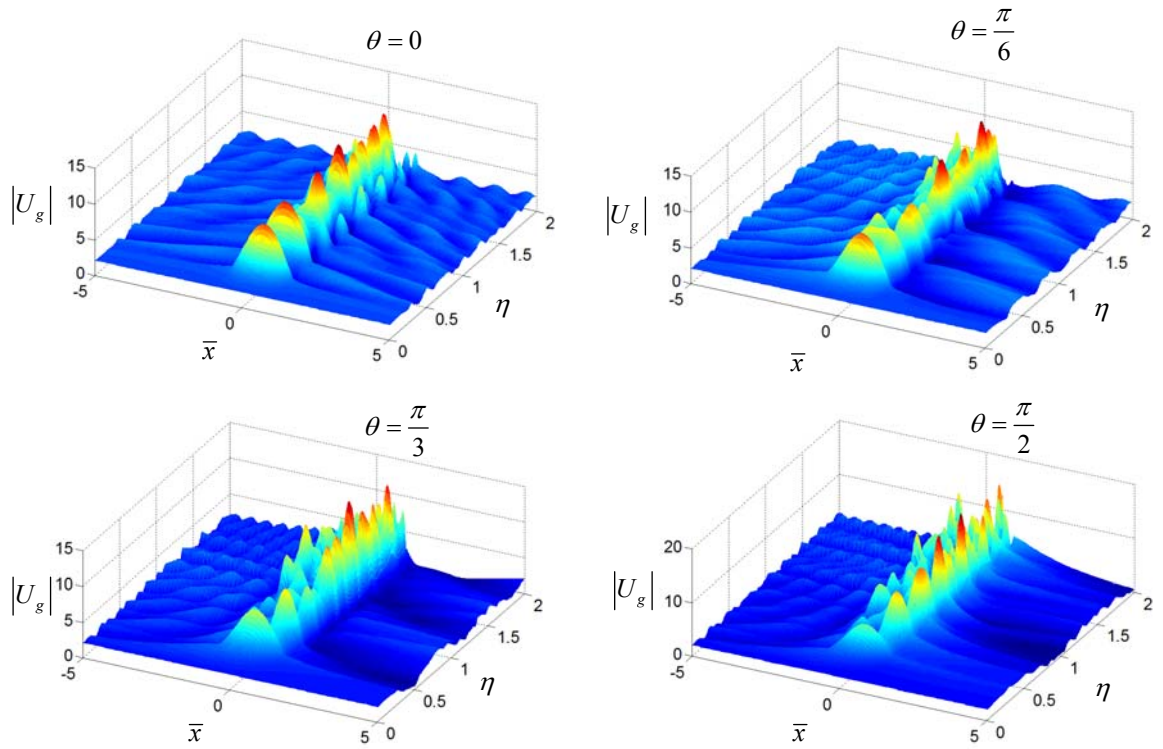
Fig. 5. Ground surface displacement amplitudes $\left|U_g\left(\bar{x}\right)\right|$ of a deep semi-elliptical alluvial basin with $b/a = 1.5$ vs. $\bar{x}$ and η
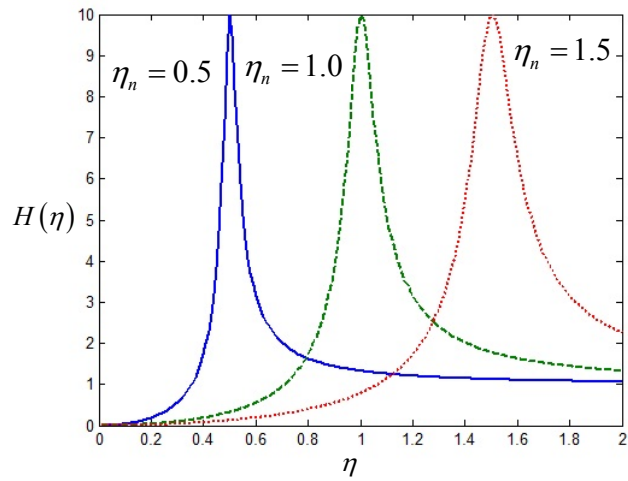
Fig. 6. Ground surface displacement amplitudes $\left|U_g\left(\bar{x}\right)\right|$ of a deep semi-elliptical alluvial basin with $b/a = 1.5$ vs. $\bar{x}$ and η
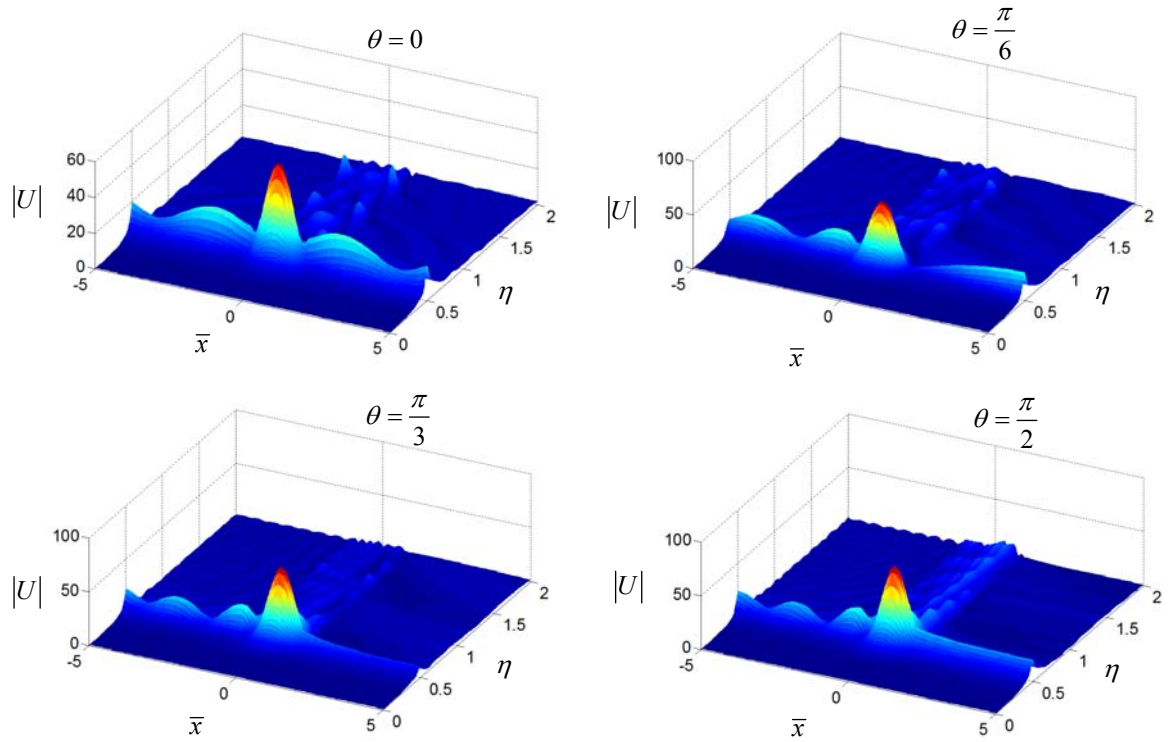
Fig. 7. Displacement amplitudes $\left|U\left(\overline{x}\right)\right|$ of SDOF system located on a shallow semi-elliptical alluvial basin with $b/a = 0.75$ vs. $\overline{x}$ and η
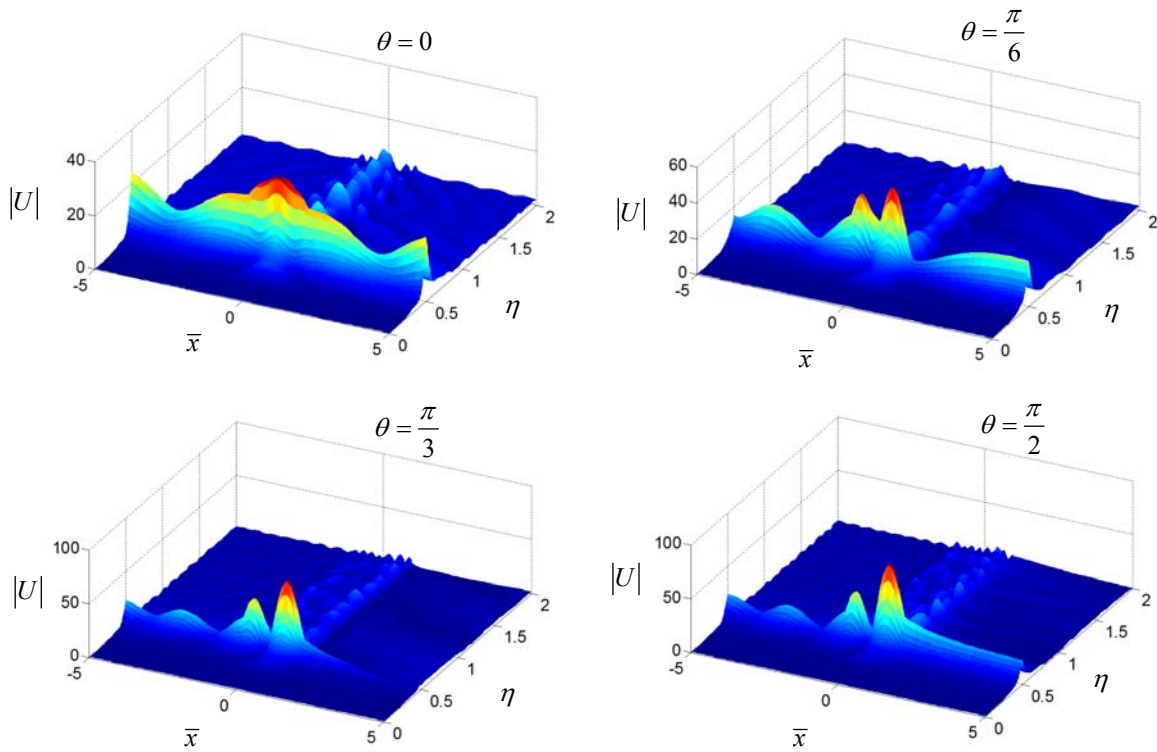
Fig. 8. Displacement amplitudes $\left|U\left(\overline{x}\right)\right|$ of SDOF system located on a deep semi-elliptical alluvial basin with $b/a = 1.5$ vs. $\overline{x}$ and η
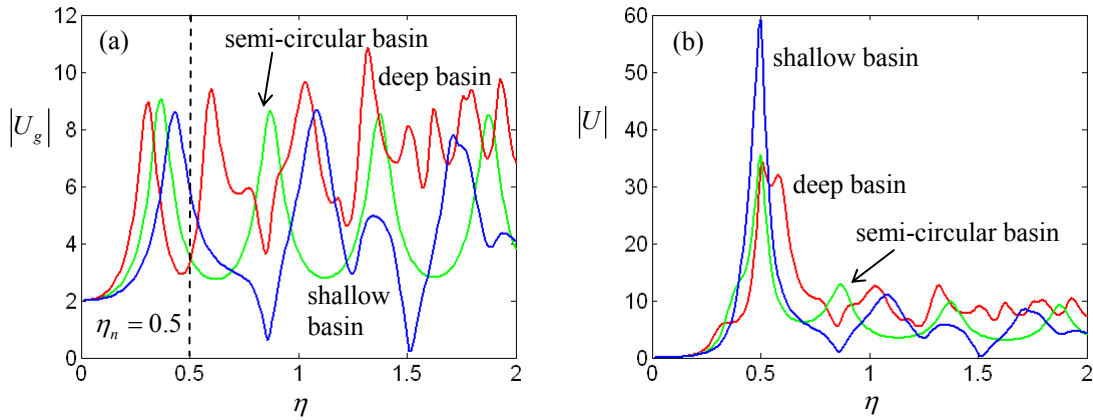
Fig. 9. (a) Displacement amplitudes of ground surface (b) displacement amplitudes of SDOF system versus η, the station located at $\bar{x} = 0$ and the incident angle $\theta = 0$

Table 1 The resonance frequencies of semi-circular basin, deep basin and shallow basin

No.	1	2	3	4	5	6	7	8
semi-circular basin	0.37	0.88	1.38	1.89	--	--	--	--
deep basin	0.31	0.61	1.04	1.33	1.52	1.63	1.81	1.94
shallow basin	0.43	1.09	1.35	1.72	--	--	--	--

CONCLUSIONS

The displacement response of an elastic SDOF system located on semi-elliptical alluvial basins subjected to incident SH wave was investigated in this study. A hybrid method was adopted to obtain the ground surface displacements of a semi-elliptical alluvial basin with different ratios of axis length under the incident SH waves. The frequency response function of displacement was calculated for an elastic SDOF system subjected to the ground surface displacement. It was realized that the influence of the semi-elliptical basin on the ground surface displacement amplitude increases with the dimensionless frequency of the SH wave. The deep alluvial basin may lead to more complex variation of displacement amplitude than the shallow alluvial basin. Also, the shallow alluvial basin may induce single significant displacement amplification as the SDOF system is located at the center of the basin. However, multiple significant amplifications may be observed from the response of the same SDOF system located on the deep elliptical basin. This study indicates that the local site effect is crucial for the structural response under ground motions. Soil-structure interaction between the structural model and the basin may be considered in the future study.

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擬辦單

擬 辦 人：丘維翰
聯 絡 電 話：
擬辦日期：中華民國101 年 11 月 6 日
附　　件：

來文摘要： 行政院國家科學委員會101年11月06日臺會合字第1010066903號函，有關「貴校土木工程系徐文信助理教授擬於101年12月赴大陸香港參加The 4th Asia-Pacific Young Researchers and Graduates Symposium (YRGS2012)，申請補助所需費用乙案，本會因限於經費，歉難補助，請 查照。」乙案。

擬辦意見：
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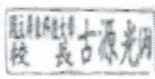
會辦單位：工學院土木工程系
決行層級：一層決行
承辦單位：研究發展處　　　　　　　　　　決行

1010009656

公文文號：1010009656 識別號：101AC00979
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	單 位	姓 名	意 見	辦理日期	憑 證
1	研究發展處 研究推動組	丘維翰		101/11/06 11:52:52（承辦）	☑
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3	研究發展處	王栢村		101/11/06 13:58:55（核示）	☑
4	工學院 土木工程系	徐文信		101/11/23 12:48:19（會辦）	☑
5	工學院 土木工程系	丁澈士		101/11/26 10:27:04（會辦）	☑
6	工學院	李佳言代理林秋豐		101/11/26 15:11:41（會辦）	☑
7	秘書室	葉美枝		101/11/26 15:48:34（決行）	☑

徐文信
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Journal of Science and Innovation

23 September 2012

Dear Dr. Wen-Shinn Shyu,

Manuscript No.: JSI-24003
Manuscript Type: Paper
Title: SH Wave Scattering by an Irregular Canyon using a New Hybrid Method
Author(s): Wen-Shinn Shyu

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